

**RELATIVE BIOAVAILABILITY OF LEAD IN SOILS
FROM THE BIG RIVER MINE TAILINGS SITE
AND SURROUNDING RESIDENTIAL AREAS**

Prepared for:

HydroGeoLogic, Inc.

Prepared by:

Stan W. Casteel, DVM, PhD, DABVT
Genny Fent, DVM
Ron Tessman, DVM
Veterinary Medical Diagnostic Laboratory
College of Veterinary Medicine
University of Missouri, Columbia
Columbia, Missouri

and

William J. Brattin, PhD
Angela M. Wahlquist, MS
Syracuse Research Corporation
Denver, Colorado

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EXECUTIVE SUMMARY

Two studies using juvenile swine as test animals were performed to measure the gastrointestinal absorption of lead from two test materials collected from the Big River Mine Tailings Site (Desloge, Missouri) and surrounding residential areas. The lead concentration in test material 1 (TM1, mine tailings) was 2,628 µg/g and the concentration of lead in test material 2 (TM2, residential yard soil) was 2,510 µg/g. The relative bioavailability of lead in each test material was assessed by comparing the absorption of lead from the test material to that of a reference material (lead acetate).

Groups of swine (typically five animals per group) were given oral doses of lead acetate or the test material twice a day for 15 days. The amount of lead absorbed by each animal was evaluated by measuring the amount of lead in the blood (measured on days 0, 2, 4, 7, 9, 12, and 15) and the amount of lead in liver, kidney, and bone (measured on day 15 at study termination). The amount of lead present in blood or tissues of animals exposed to a test material was compared to that for animals exposed to lead acetate, and the results were expressed as relative bioavailability (RBA). The RBA results for these two test materials are summarized below:

Measurement Endpoint	Estimated RBA (90% Confidence Interval)	
	TM1 Big River Mine Tailings Piles Composite	TM2 Big River Residential Yard Soil Composite
Blood Lead AUC	0.39 (0.30 - 0.53)	0.78 ^a
Liver Lead	0.36 (0.29 - 0.44)	0.85 (0.55 - 1.54)
Kidney Lead	0.46 (0.37 - 0.56)	0.81 (0.60 - 1.20)
Femur Lead	0.40 (0.32 - 0.49)	0.77 (0.60 - 1.03)
Point Estimate	0.40 (0.30 - 0.51)	0.80 (0.54 - 1.09)

^aUpper and lower bounds could not be calculated, as Fieller's theorem failed.

As seen, using lead acetate as a relative frame of reference, the RBA estimate for TM1 is about 40% with a 90% confidence interval of 30%-51%. The RBA estimate for TM2 (yard soils) is about 80% with a 90% confidence interval of 54%-109%. These relative bioavailability estimates may be used to improve accuracy and decrease uncertainty in estimating human health risks from exposure to these test materials.

It is important to understand that these bioavailability estimates are subject to uncertainty that arises from several different sources. One source of uncertainty stems from the inherent biological variability between different animals, which is characterized by the confidence range around the endpoint-specific and the point estimate RBA values shown above. Note that because Study 2 included only a single dose level of lead acetate with fewer test animals than is typical, the resulting RBA estimates for TM2 have even larger confidence bounds than usual. However,

there is also uncertainty in the extrapolation of RBA values measured in juvenile swine to humans, and this uncertainty is not included in the statistical confidence bounds above. Even though juvenile swine are considered to be a good model for lead absorption in children, differences between swine and children could result in differences in RBA. In addition, RBA may depend on the amount and type of food in the stomach. In this regard, RBA values measured in these studies are based on animals that have little or no food in their stomach at the time of lead exposure, and hence are likely to yield values of RBA that may be somewhat conservative for humans who ingest the soils along with food.

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1.0 INTRODUCTION

1.1 Overview of Bioavailability

Reliable analysis of the potential hazard to humans from ingestion of lead depends upon accurate information on a number of key parameters, including lead concentration in environmental media (e.g., soil, dust, water, food, air, paint), intake rates of each medium, and the rate and extent of lead absorption by the body from an ingested medium (“bioavailability”). Knowledge of lead bioavailability is important because the amount of lead that actually enters the body from an ingested medium depends on the physical-chemical properties of the lead and of the medium. For example, lead in soil may exist, at least in part, as poorly water-soluble minerals, and may also exist inside particles of inert matrix such as rock or slag of variable size, shape, and association; these chemical and physical properties may influence the absorption (bioavailability) of lead when ingested. Thus, equal ingested doses of different forms of lead in different media may not be of equal health concern.

Bioavailability is normally described as the fraction or percentage of a chemical that is absorbed by the body following an exposure of some specified amount, duration, and route (usually oral). Bioavailability of lead in a particular medium may be expressed either in absolute terms (absolute bioavailability) or in relative terms (relative bioavailability). Absolute bioavailability (ABA) is the ratio of the amount of lead absorbed compared to the amount ingested:

$$\text{ABA} = (\text{Absorbed Dose}) / (\text{Ingested Dose})$$

This ratio is also referred to as the oral absorption fraction (AFo). Relative bioavailability (RBA) is the ratio of the absolute bioavailability of lead present in some test material compared to the absolute bioavailability of lead in some appropriate reference material:

$$\text{RBA} = \text{ABA}(\text{test}) / \text{ABA}(\text{reference})$$

Usually the form of lead used as reference material is a soluble compound such as lead acetate that is expected to completely dissolve when ingested.

For example, if 100 micrograms (μg) of lead dissolved in drinking water were ingested and a total of 50 μg entered the body, the ABA would be 50/100, or 0.50 (50%). Likewise, if 100 μg of lead contained in soil were ingested and 30 μg entered the body, the ABA for soil would be 30/100, or 0.30 (30%). If the lead dissolved in water were used as the frame of reference for describing the relative amount of lead absorbed from soil, the RBA would be 0.30/0.50, or 0.60 (60%).

For additional discussion about the concept and application of bioavailability, see Gibaldi and Perrier (1982), Goodman et al. (1990), Mushak (1991), and/or Klaassen et al. (1996).

1.2 Using Bioavailability Data to Improve Exposure Calculations for Lead

When reliable data are available on the bioavailability of lead in soil, dust, or other soil-like waste materials at a site, this information can be used to improve the accuracy of exposure and risk calculations at that site. For example, the basic equation for estimating the site-specific ABA of a test soil is as follows:

$$\text{ABA}_{\text{soil}} = \text{ABA}_{\text{soluble}} \cdot \text{RBA}_{\text{soil}}$$

where:

ABA_{soil}	=	Absolute bioavailability of lead in soil ingested by a human
$\text{ABA}_{\text{soluble}}$	=	Absolute bioavailability in children of some dissolved or fully soluble form of lead
RBA_{soil}	=	Relative bioavailability of lead in soil as measured in swine

Based on available information on lead absorption in humans and animals, the U.S. Environmental Protection Agency (USEPA) estimates that the absolute bioavailability of lead from water and other fully soluble forms of lead is usually about 50% in children (USEPA, 1991) and about 20% in adults (USEPA, 2003). Thus, when a reliable site-specific RBA value for soil is available, it may be used to estimate a site-specific absolute bioavailability in that soil, as follows:

$$\text{ABA}_{\text{soil}} (\text{child}) = 50\% \cdot \text{RBA}_{\text{soil}}$$

$$\text{ABA}_{\text{soil}} (\text{adult}) = 20\% \cdot \text{RBA}_{\text{soil}}$$

The default RBA used by USEPA for lead in soil and dust compared to lead in water is 60% for both children and adults. When the measured RBA in soil or dust at a site is found to be less than 60% compared to some fully soluble form of lead, it may be concluded that exposures to and hazards from lead in these media at that site are probably lower than the typical default assumptions. If the measured RBA is higher than 60%, absorption of and hazards from lead in these media may be higher than usually assumed.

1.3 Purpose of this Study

The objective of these *in vivo* bioavailability studies was to determine the oral bioavailability of lead in two test materials collected from the Big River Mine Tailings Site (Desloge, Missouri) and surrounding residential areas relative to the bioavailability of lead acetate using juvenile swine as a test system. The relative bioavailability estimates may be used to improve accuracy and decrease uncertainty in estimating human health risks from exposure to these test soils.

2.0 STUDY DESIGN

This investigation of lead absorption was performed in two sequential studies. The study design was patterned after the standardized study protocol for measuring relative bioavailability of lead (USEPA, 2004) using the juvenile swine model. The basic design for each of these two studies is presented in Table 2-1. As shown, each study investigated lead absorption from lead acetate (the reference material) and two site-specific soil samples (the test materials). Each material was administered to groups of five animals at three different dose levels for 15 days, with one exception¹ (detailed schedules for Study 1 and Study 2 are presented in Appendix Tables A-1 and B-1, respectively). Additionally, each study included a non-treated group of three animals to serve as a control for determining background lead levels. All doses were administered orally. Study details are provided below. The study was performed as nearly as possible within the spirit and guidelines of Good Laboratory Practices (GLP: 40 CFR 792).

2.1 Test Materials

2.1.1 Big River Mine Tailings Piles Composite

Test material 1 (TM1), tested in Study 1, was a composite of samples collected from tailings piles at the Big River Mine Tailings Site in Desloge, Missouri. Sampling consisted of collecting 30 aliquots from the upper 6 inches of material at each mine tailings pile. Included in the composite were samples from the Bonne Terre Flats Pile, Elvins Pile, National Pile, Leadwood Pile, and the Desloge Pile. Although samples were collected from the Federal pile, they were not included in the composite due to very low concentrations of lead.

Each individual tailings sample was air dried and sieved to <250 microns using a #60 sieve. The sieved material from the tailings piles (excluding the Federal pile) was then composited to form TM1. The concentration of lead in TM1 was measured in triplicate by flame atomic absorption; the resulting mean lead value was 2,628 µg/g.

2.1.2 Big River Residential Yard Soil

Test material 2 (TM2), tested in Study 2, was a composite of soil samples collected from residential yards surrounding the Big River Mine Tailings Site. Sampling consisted of the collection of 5 aliquots of soil from the upper 1 inch of soil horizon per yard quadrant.

Each individual yard soil sample was air dried and sieved to <250 microns using a #60 sieve. The sieved soil from all residential sample locations was then composited to form TM2. The concentration of lead in TM2 was measured in triplicate by flame atomic absorption; the resulting mean lead value was 2,510 µg/g.

¹ In the Study 2, lead acetate was administered at a single dose level to a group of three animals.

2.2 Experimental Animals

Juvenile swine were selected for use in this study because they are considered to be a good physiological model for gastrointestinal absorption in children (Weis and LaVelle, 1991; Casteel et al., 1996). The animals were intact males of the Pig Improvement Corporation (PIC) genetically defined Line 26, and were purchased from Chinn Farms, Clarence, MO.

The number of animals purchased for each study was several more than required by the protocol. These animals were purchased at an age of about 5-6 weeks (weaning occurs at age 3 weeks) and housed in individual lead-free stainless steel cages. The animals were then held under quarantine for one week to observe their health before beginning exposure to test materials. Each animal was examined by a certified veterinary clinician (swine specialist) and any animals that appeared to be in poor health during this quarantine period were excluded from the study. To minimize weight variations among animals and groups, extra animals most different in body weight (either heavier or lighter) four days prior to exposure (day -4) were also excluded from the study. The remaining animals were assigned to dose groups at random (group assignments are presented in Appendix Tables A-2 and B-2).

When exposure began (day zero), the animals were about 6-7 weeks old and weighed an average of about 10.4 kg in Study 1 and 9.7 kg in Study 2. The animals were weighed every three days during the course of the study. In Study 1, the average weight gain was about 0.39 kg/day and the rate of weight gain was comparable in all dosing groups, ranging from 0.28 to 0.47 kg/day. In Study 2, the average weight gain was about 0.32 kg/day and the rate of weight gain was comparable in all dosing groups, ranging from 0.19 to 0.40 kg/day. These body weight data are summarized in Figure 2-1 and are also presented in Appendix Tables A-3 and B-3.

All animals were examined daily by an attending veterinarian while on study. Most animals ($N = 54$) exhibited no problems throughout the two studies. Several animals (6 on Study 1; 5 on Study 2) were treated for illness (fever, inappetance, diarrhea) with Naxcel. See Appendix Tables A-4 and B-4 for details on animal health.

2.3 Diet

Animals were weaned onto standard pig chow (purchased from MFA Inc., Columbia, MO) by the supplier. In order to minimize lead exposure from the diet, the animals were gradually transitioned from the MFA feed to a special low-lead feed (guaranteed less than 0.2 ppm lead, purchased from Zeigler Brothers, Inc., Gardners, PA), and this feed was maintained for the duration of the study. The feed was nutritionally complete and met all requirements of the National Institutes of Health–National Research Council. The typical nutritional components and chemical analysis of the feed are presented in Table 2-2. Each day every animal was given an amount of feed equal to 4.5% of the mean body weight of all animals on study. Feed amounts were adjusted every three days, when pigs were weighed. Feed was administered in two equal portions at 11:00 AM and 5:00 PM daily. Analysis of random low-lead feed samples indicated that the lead level did not exceed the detection limit of 0.05 $\mu\text{g/g}$.

Drinking water was provided *ad libitum* via self-activated watering nozzles within each cage. Analysis of samples from randomly selected drinking water nozzles indicated the lead concentration did not exceed the detection limit of 1 µg/L.

2.4 Dosing

The protocol for exposing animals to lead is shown in Table 2-1. Previous swine investigations have shown that lead doses of 25-225 µg/kg-day typically result in clear and measurable increases in lead levels in all endpoints measured (blood, liver, kidney, and bone). For these two studies, the target doses were 50, 150, and 300 µg/kg-day. The actual administered doses were calculated based on the lead content of the materials administered and the measured group mean body weights^{2,3}. Specifically, doses of lead for the three days following each weighing were based on the group mean body weight adjusted by the addition of 1 kg to account for the expected weight gain over the time interval. After completion of the study, body weights were estimated by interpolation for those days when measurements were not collected and the actual administered doses were calculated for each day and then averaged across all days. The actual mean doses for each dosing group are included in Table 2-1; the actual lead doses administered to each pig are presented in Appendix Tables A-3 and B-3.

Animals were exposed to lead acetate or a test material for 15 days, with the dose for each day being administered in two equal portions beginning at 9:00 AM and 3:00 PM (two hours before feeding), with two minute intervals allowed for individual pig dosing. Dose material was placed in the center of a small portion (about 5 grams) of moistened feed (this is referred to as a “doughball”), and this was administered to the animals by hand. If uneaten portions of doughballs were discovered, these were retrieved and offered again for consumption. Occasionally, some animals did not consume their entire dose. In these instances, the missed doses were estimated and recorded and the time-weighted average dose calculation for each animal was adjusted downward accordingly (see Appendix Tables A-3 and B-3).

2.5 Collection of Biological Samples

Samples of blood were collected from each animal on the first day of exposure (day 0) and on days 2, 4, 7, 9, 12, and 15 following the start of exposure. All blood samples were collected by vena-puncture of the anterior vena cava, and samples were immediately placed in purple-top Vacutainer® tubes containing EDTA (ethylenediaminetetra-acetic acid) as anticoagulant. Although EDTA is a chelator of metals, the nitric acid digest used in the analysis destroys the organic constituents in the blood, thereby freeing all lead for analysis. Thus, the presence of EDTA in the sampling tubes will not impact the analytical results for lead. Blood samples were collected each sampling day beginning at 8:00 AM, approximately one hour before the first of the two daily exposures to lead on the sampling day and 17 hours after the last lead exposure the

² Due to a rounding error, doses of TM1 were calculated based on a lead concentration of 2622 µg/g instead of the final estimate of 2628 µg/g lead in the test material.

³ Due to a miscommunication of the target doses for Study 1, the day 0 doses for groups 1, 2, 3, and 6 were administered at incorrect dose levels (see Appendix Table A-3). However; the correct doses were administered on all subsequent days, including Days 1 and 2.

previous day. This blood collection time was selected because the rate of change in blood lead resulting from the preceding exposures is expected to be relatively small after this interval (LaVelle et al., 1991; Weis et al., 1993), so the exact timing of sample collection relative to the last dosing is not likely to be critical.

Following collection of the final blood sample on day 15, all animals were humanely euthanized and samples of liver, kidney, and bone (the right femur, defleshed) were removed and stored at -80°C in lead-free plastic bags for lead analysis.

Samples of all biological samples collected were archived in order to allow for reanalysis and verification of lead levels, if needed. All animals were also subjected to detailed examination at necropsy by a certified veterinary pathologist in order to assess overall animal health.

2.6 Preparation of Biological Samples for Analysis

Blood

One mL of whole blood was removed from the purple-top Vacutainer® tube and added to 9.0 mL of “matrix modifier,” a solution recommended by the Centers for Disease Control and Prevention (CDC) for analysis of blood samples for lead. The composition of matrix modifier is 0.2% (v/v) ultrapure nitric acid, 0.5% (v/v) Triton X-100, and 0.2% (w/v) dibasic ammonium phosphate in deionized distilled water.

Liver and Kidney

One gram of soft tissue (liver or kidney) was placed in a lead-free screw-cap Teflon container with 2 mL of concentrated (70%) nitric acid and heated in an oven to 90°C overnight. After cooling, the digestate was transferred to a clean lead-free 10 mL volumetric flask and diluted to volume with deionized distilled water.

Bone

The right femur of each animal was defleshed, broken, and dried at 100°C overnight. The dried bones were then placed in a muffle furnace and dry-ashed at 450°C for 48 hours. Following dry ashing, the bone was ground to a fine powder using a lead-free mortar and pestle, and 200 mg was removed and dissolved in 10.0 mL of 1:1 (v:v) concentrated nitric acid/water. After the powdered bone was dissolved and mixed, 1.0 mL of the acid solution was removed and diluted to 10.0 mL in deionized distilled water.

2.7 Lead Analysis

Samples of biological tissue (blood, liver, kidney, and bone) and other materials (e.g., food, water, reagents, solutions) were analyzed for lead by graphite furnace atomic absorption using a Perkin Elmer AAnalyst 800 high-performance atomic absorption spectrometer. Internal quality assurance samples are described in the following section (2.8).

The quantitation limit was defined as three-times the standard deviation of a set of seven replicates of a low-lead sample (typically about 2-5 µg/L). The standard deviation was usually about 0.3 µg/L, so the quantitation limit was usually about 0.9-1.0 µg/L. For prepared blood samples (diluted 1/10), this corresponds to a quantitation limit of 10 µg/L (1 µg/dL). For soft tissues (liver and kidney, diluted 1/10), this corresponds to a quantitation limit of 10 µg/kg (ng/g) wet weight, and for bone (diluted 1/500) the corresponding quantitation limit is 0.5 µg/g (ng/g) ashed weight. All responses below the quantitation limit were evaluated at one-half the quantitation limit.

Lead analytical results for Study 1 samples are presented in Table A-5 of Appendix A; results for Study 2 are presented in Table B-5 of Appendix B. The results for quality assurance samples are presented in Appendix Tables A-6 and B-6; quality assurance results are summarized below.

2.8 Quality Assurance

A number of quality assurance (QA) steps were taken during this project to evaluate the accuracy of the analytical procedures. These included:

Spike Recovery

Randomly selected samples were spiked with known amounts of lead (as lead acetate) and the recovery of the added lead was measured. For Study 1, recovery for individual samples ranged from 78% to 114%, with an average of $95 \pm 8\%$ ($N = 29$). For Study 2, spike recoveries ranged from 80% to 115%, with an average of $93 \pm 8\%$ ($N = 31$). In addition, several preparative spikes of liver and kidney were analyzed in Study 1; recovery ranged from 77% to 138%, with an average of $114\% \pm 24\%$ ($N = 6$).

Duplicate Analysis of Sample Digestate

Periodically during sample analysis, samples were randomly selected for duplicate analysis (i.e., the same prepared sample was analyzed twice). All duplicate results ($N = 63$) agreed within $\pm 15\%$ relative percent difference (RPD) (for analytical results greater than 10 µg/L) or $\pm 1\%$ µg/L (for analytical results less than or equal to 10 µg/L), as required by the analytical protocol.

Sample Preparation Replicates

A random selection of about 10-15% of all biological samples generated during each study were prepared for laboratory analysis in duplicate (i.e., two separate subsamples of blood/tissue were prepared for analysis). The results for these replicate preparations are summarized in Figure 2-2. As seen, the analytical results for replicate pairs of blood samples (Panel A of Figure 2-2) tend to follow the line of equality, indicating that the replicate pairs are generally in good agreement. The absolute difference between replicate pairs of blood samples ranged from 0 to 4.2 µg/dL with an average of 0.47 µg/dL ($N = 42$) across both studies. In most cases, there was also good reproducibility between replicate samples for tissues (Panels B and C of Figure 2-2). The absolute difference between replicate pairs of liver and kidney samples ranged from 0 to 0.24 µg/g with an average of 0.05 µg/g ($N = 12$). The absolute difference between replicate pairs of femur samples ranged from 0 to 2.0 µg/g with an average of 0.7 µg/g ($N = 6$).

Laboratory Control Standards

Laboratory control standards (samples of reference materials for which a certified concentration of lead has been established) were tested periodically during sample analysis. Results for the standards are summarized below:

Standard	Target Value (Acceptable Range)	Mean	Range	SD	Mean % Recovery	N
NIST SRM 1640 (natural water) ^a	27.89 (27.75 - 28.03)	29.5	27 – 31	0.9	105.6%	22
DOLT-3 (dogfish liver) ^a	0.319 (0.274 - 0.365)	0.351	0.350 – 0.352	0.002	110.1%	3
TORT-2 (lobster hepatopancreas) ^a	0.35 (0.22 - 0.48)	0.35	0.33 – 0.37	0.02	100.3%	3
NIST SRM 1400 (bone ash)	9.07 (8.95 - 9.19)	13.5	12 – 15	2.12	107.5%	2

^a From Study 2 only

As seen, recovery of lead from these standards was generally good and within the acceptable range.

Blood Lead Check Samples

The CDC provides a variety of blood lead “check samples” for use in quality assurance programs for blood lead studies. Several CDC check samples of different concentrations were analyzed periodically during blood sample analysis. The results are summarized in Figure 2-3. In both studies, the results for all standards generally cluster around the line of equality, but tend to be slightly lower than expected in Study 1; the reason for this is not known.

Blanks

Samples of the sample preparation matrix for each endpoint (without added tissue) were routinely analyzed for lead to ensure the absence of lead contamination. These matrix blanks never exceeded the detection limit of 1 µg/L (N = 91).

Based on the results of all of the quality assurance samples and steps described above, it is concluded that the analytical results are of sufficient quality for derivation of reliable estimates of lead absorption from test materials.

3.0 DATA ANALYSIS

3.1 Overview

The basic approach for measuring lead absorption *in vivo* is to administer an oral dose of lead to test animals and measure the increase in lead level in one or more body compartments (e.g., blood, soft tissue, bone). In order to calculate the RBA value of a test material, the increase in lead in a body compartment is measured both for that test material and a reference material (lead acetate). Because equal absorbed doses of lead (as Pb⁺²) will produce equal responses (i.e., equal increases in concentration in tissues) regardless of the source or nature of the ingested lead, the RBA of a test material is calculated as the ratio of doses (test material and reference material) that produce equal increases in lead concentration in the body compartment. Thus, the basic data reduction task required to calculate an RBA for a test material is to fit mathematical equations to the dose-response data for both the test material and the reference material, and then solve the equations to find the ratio of doses that would be expected to yield equal responses.

Some biological responses to lead exposure may be non-linear functions of dose (i.e., tending to flatten out or plateau as dose increases). The cause of this non-linearity is uncertain but might be due either to non-linear absorption kinetics and/or to non-linear biological response per unit dose absorbed. However, the principal advantage of the approach described above is that it is not necessary to understand the basis for a non-linear dose response curve (non-linear absorption and/or non-linear biological response) in order to derive valid RBA estimates; in addition, this approach is general and yields reliable results for both non-linear and linear responses.

A detailed description of the curve-fitting methods and rationale, along with the methods used to quantify uncertainty in the RBA estimates for the test material, are presented in USEPA (2004) and are summarized below.

3.2 Measurement Endpoints

Four independent measurement endpoints were evaluated based on the concentration of lead observed in blood, liver, kidney, and bone (femur). For liver, kidney, and bone, the measurement endpoint was simply the concentration in the tissue at the time of sacrifice (day 15). The measurement endpoint used to quantify the blood lead response was the area under the curve (AUC) for blood lead vs. time (days 0-15). AUC was selected because it is the standard pharmacokinetic index of chemical uptake into the blood compartment, and is relatively insensitive to small variations in blood lead level by day. The AUC was calculated using the trapezoidal rule to estimate the AUC between each time point that a blood lead value was measured (days 0, 1, 2, 3, 5, 7, 9, 12, and 15):

$$AUC(d_i \text{ to } d_j) = 0.5 \cdot (r_i + r_j) \cdot (d_j - d_i)$$

where:

d = day number

r = response (blood lead value) on day i (r_i) or day j (r_j)

The areas were then summed across all time intervals in the study to yield the final AUC for each animal.

Blood Lead Outliers

Occasionally blood lead values are obtained that are clearly different than expected. Blood lead values that were more than a factor of 1.5 above or below the group mean for any given day were flagged as potential outliers and are shaded in Appendix Tables A-7 and B-7. Each data point identified in this way was reviewed and professional judgment was used to decide if the value should be retained or excluded. In order to avoid inappropriate biases, blood lead outlier designations are restricted to values that are clearly aberrant from a time-course and/or dose-response perspective. Four values in Study 1 were judged to be clear outliers; these are identified by a heavy black box outlining the values in Appendix Table A-7. These blood lead values were excluded from the calculation of AUC; the missing values were replaced with values interpolated from the preceding and following values from the same animal. No blood lead data in Study 2 were excluded as outliers.

3.3 Dose-Response Models

Basic Equations

It has been shown previously (USEPA, 2004) that nearly all blood lead AUC data sets can be well-fit using an exponential equation and most tissue (liver, kidney, and bone) lead data can be well-fit using a linear equation, as follow:

$$\text{Linear (liver, kidney, bone): } \text{Response} = a + b \cdot \text{Dose}$$

$$\text{Exponential (blood lead AUC): } \text{Response} = a + b \cdot [1 - \exp(-c \cdot \text{Dose})]$$

As discussed below, all endpoint data were analyzed using simultaneous, weighted least squares regression. All linear model fitting was performed in Microsoft® Office Excel using matrix functions. Exponential model fitting was performed using JMP® version 3.2.2, a commercial software package developed by SAS®.

Simultaneous Regression

Because the data to be analyzed consist of three dose-response curves for each endpoint (the reference material and two test materials) and there is no difference between the curves when the dose is zero, all three curves for a given endpoint must have the same intercept. This requirement is achieved by combining the two dose response equations into one and solving for the parameters simultaneously, resulting in the following equations:

$$\text{Linear: } y = a + b_r \cdot x_r + b_t \cdot x_t$$

$$\text{Exponential: } y = a + b \cdot [(1 - \exp(-c_r \cdot x_r)) + (1 - \exp(-c_t \cdot x_t))]$$

where:

y = response

x = dose

a, b, c = empirical coefficients for the reference material (r) and test material (t).

Weighted Regression

Regression analysis based on ordinary least squares assumes that the variance of the responses is independent of the dose and/or the response (Draper and Smith, 1998). It has previously been shown that this assumption is generally not satisfied in swine-based RBA studies, where there is a tendency toward increasing variance in response as a function of increasing dose (heteroscedasticity) (USEPA, 2004). To deal with heteroscedasticity, the data are analyzed using weighted least squares regression. In this approach, each observation in a group of animals is assigned a weight that is inversely proportional to the variance of the response in that group:

$$w_i = (\sigma^2_i)^{-1}$$

where:

w_i = weight assigned to all data points in dose group i

σ^2_i = variance of responses of animals in dose group i

(Draper and Smith, 1998).

As discussed in USEPA (2004), there are several alternative strategies for assigning weights. The preferred method identified by USEPA (2004) and the method used in this study estimates the value of σ^2_i using an “external” variance model based on an analysis of the relationship between variance and mean response using data consolidated from ten different swine-based lead RBA studies. Log-variance increases as an approximately linear function of log-mean response for all four endpoints:

$$\ln(s_i^2) = k1 + k2 \cdot \ln(\bar{y}_i)$$

where:

s_i^2 = observed variance of responses of animals in dose group i

\bar{y}_i = mean observed response of animals in dose group i

Values of k1 and k2 were derived for each endpoint using ordinary least squares minimization, and the resulting values are shown below:

Endpoint	k1	k2
Blood AUC	-1.3226	1.5516
Liver	-2.6015	2.0999
Kidney	-1.8499	1.9557
Femur	-1.9713	1.6560

Goodness-of-Fit

The goodness-of-fit of each dose-response model was assessed using the F test statistic and the adjusted coefficient of multiple determination (Adj R^2) as described by Draper and Smith (1998). A fit is considered acceptable if the p-value is less than 0.05.

Assessment of Outliers

In biological assays, it is not uncommon to note the occurrence of individual measured responses that appear atypical compared to the responses from other animals in the same dose group. In these studies, endpoint responses yielding standardized weighted residuals greater than 3.5 or less than -3.5 were considered to be potential outliers (Canavos, 1984). When such data points are encountered in a data set, the RBA is calculated both with and without the potential outlier(s) excluded, and the result with the outlier(s) excluded is used as the preferred estimate.

3.4 Calculation of RBA Estimates

Endpoint-specific RBA Estimates

Lead RBA values were estimated using the basic statistical techniques recommended by Finney (1978). Each endpoint-specific RBA value was calculated as the ratio of a model coefficient for the reference material data set and for the test material data set:

$$\begin{array}{ll} \text{Linear endpoints:} & \text{RBA}_t = b_t / b_r \\ \text{Exponential endpoint:} & \text{RBA}_t = c_t / c_r \end{array}$$

The uncertainty range about the RBA ratio was calculated using Fieller's Theorem as described by Finney (1978).

RBA Point Estimate

Because there are four independent estimates of RBA (one from each measurement endpoint) for a given test material, the final RBA estimate for a test material involves combining the four endpoint-specific RBA values into a single value (point estimate) and estimating the uncertainty around that point estimate. As described in USEPA (2004), analysis of data from multiple studies suggests that the four endpoint-specific RBA values are all approximately equally reliable (as reflected in the average coefficient of variation in RBA values derived from each endpoint). Therefore, the RBA point estimate for the test material was calculated as the simple mean of all four endpoint-specific RBA values.

The uncertainty bounds around this point estimate were estimated using Monte Carlo simulation. Values for RBA were drawn from the uncertainty distributions for each endpoint with equal frequency. Each endpoint-specific uncertainty distribution was assumed to be normal, with the mean equal to the best estimate of RBA and the standard deviation estimated from Fieller's Theorem (Finney, 1978). The uncertainty in the point estimate was characterized as the range from the 5th to the 95th percentile of the mean across endpoints.

4.0 RESULTS

4.1 Clinical Signs

The doses of lead administered in these two studies are below a level that is expected to cause toxicological responses in swine, and no clinical signs of lead-induced toxicity were noted in any of the animals used in the studies.

4.2 Blood Lead vs. Time

Detailed results from Study 1 and Study 2 are presented in Appendices A and B, respectively; blood lead data for individual animals are presented in Figures A-1 and B-1. Group mean blood lead values as a function of time are shown in Figure 4-1. As seen, blood lead values began below quantitation limits (about 1 µg/dL) in all groups, and remained below quantitation limits in control animals (Group 10). In animals given repeated oral doses of lead acetate or test soil, blood levels began to rise within 1-3 days, and tended to plateau by the end of the study (day 15).

4.3 Dose-Response Patterns

Variance

As discussed in Section 3.3, the dose-response data are analyzed using weighted least squares regression and the weights are assigned using an “external” variance model (USEPA, 2004). As shown in Figures 4-2 (Study 1) and 4-3 (Study 2), the variance of the data from these studies is generally quite similar to that of the data used to generate the variance model for all four measurement endpoints.

Blood Lead AUC

As discussed in Section 3.2, the measurement endpoint used to quantify the blood lead response was the area under the curve (AUC) for blood lead vs. time (days 0-15). The AUC determinations are presented in Appendix Tables A-8 and B-8.

The blood lead AUC dose-response data were modeled using an exponential equation (see Section 3.3). The results of this fitting are shown in Figure 4-4 (Study 1) and Figure 4-5 (Study 2). No blood lead AUC outliers were identified in either study; no AUC data were excluded from the final evaluation of blood lead RBA.

Because Study 2 only included a single dose level of lead acetate with fewer test animals than is typical, calculating RBA values based on lead acetate is difficult and the resulting estimates have lower confidence than usual. It is particularly difficult to fit a non-linear model through only the control and one dose group having only the single test material to help define the plateau. However, in this case, the resulting RBA is very closely in line with the other three endpoint

RBA estimates for TM2 (see below), so it was deemed acceptable to include the blood lead AUC in the final determination of RBA (see section 4.4 below).

Tissue Lead

The dose-response data for lead in liver, kidney, and bone (measured at sacrifice on day 15) were modeled using a linear equation (see Section 3.3). The results of these fittings are shown in Figures 4-6 (Study 1) and 4-7 (Study 2) for liver, 4-8 (Study 1) and 4-9 (Study 2) for kidney, and 4-10 (Study 1) and 4-11 (Study 2) for femur. No endpoint outliers were identified in either study; no endpoint data were excluded from the final evaluation of lead RBA.

As mentioned above, the design of Study 2 (only a single dose level of lead acetate with fewer test animals than is typical) results in much lower confidence around the RBA estimates for TM2.

4.4 Calculated RBA Values

Relative bioavailability values for the test soils were calculated for each measurement endpoint (blood lead AUC, liver, kidney, and bone) using the method described in Section 3.4; the suggested point estimate is calculated as the simple mean of the four endpoint-specific estimates. The results are shown below:

Measurement Endpoint	Estimated RBA (90% Confidence Interval)	
	TM1 Big River Mine Tailings Piles Composite	TM2 Big River Residential Yard Soil Composite
Blood Lead AUC	0.39 (0.30 - 0.53)	0.78 ^a
Liver Lead	0.36 (0.29 - 0.44)	0.85 (0.55 - 1.54)
Kidney Lead	0.46 (0.37 - 0.56)	0.81 (0.60 - 1.20)
Femur Lead	0.40 (0.32 - 0.49)	0.77 (0.60 - 1.03)
Point Estimate	0.40 (0.30 - 0.51)	0.80 (0.54 - 1.09)

^aUpper and lower bounds could not be calculated, as Fieller's theorem failed.

As seen, using lead acetate as a relative frame of reference, the RBA estimate for TM1 (tailings) is about 40% with a 90% confidence interval of 30%-51%. The RBA estimate for TM2 (yard soils) is about 80% with a 90% confidence interval of 54%-109%. Note that exclusion of Study 2 blood lead AUC has almost no impact on the RBA point estimate for TM2 (80% with a 90% confidence interval of 54%-112%).

4.5 Uncertainty

The bioavailability estimates above are subject to uncertainty that arises from several different sources. One source of uncertainty is the inherent biological variability between different animals in a dose group, which in turn causes variability in the amount of lead in the tissues of the exposed animals. This between-animal variability in response results in statistical uncertainty in the best-fit dose-response curves and, hence, uncertainty in the calculated values of RBA. Such statistical uncertainty is accounted for by the statistical models used above and is characterized by the uncertainty range around the endpoint-specific and the point estimate values of RBA. Note that because Study 2 included only a single dose level of lead acetate with fewer test animals than is typical, the resulting RBA estimates for TM2 have even larger confidence bounds than usual.

However, there is also uncertainty in the extrapolation of RBA values measured in juvenile swine to young children or adults, and this uncertainty is not included in the statistical confidence bounds above. Even though the immature swine is believed to be a useful and meaningful animal model for gastrointestinal absorption in children, it is possible that there are differences in physiological parameters that may influence RBA and that RBA values in swine are not identical to values in children. In addition, RBA may depend on the amount and type of food in the stomach, since the presence of food can influence stomach pH, holding time, and possibly other factors that may influence lead solubilization. In this regard, it is important to recall that RBA values measured in this study are based on animals that have little or no food in their stomach at the time of lead exposure and, hence, are likely to yield high-end values of RBA. Thus, these RBA values may be somewhat conservative for humans who ingest the soils along with food. The magnitude of this bias is not known.

5.0 CONCLUSIONS AND RECOMMENDATIONS

When reliable site-specific data are lacking, the USEPA typically employs a default RBA value of 60% for lead in soil compared to soluble lead in water, for both children and adults. The RBA estimate for test material 1 (40%) is lower than the default value of 60%, indicating that absorption of and hazards from lead in this soil may be lower than usually assumed. The RBA estimate for test material 2 (80%) is higher than the default value of 60%, indicating that absorption of and hazards from lead in this soil may be higher than usually assumed. These site-specific RBA estimates for lead are an improvement over the default value and should be considered for use in site-specific risk assessments. However, it is important to consider that the values are specific to the soils tested in these studies and to take into account the high uncertainty around the RBA estimates for TM2, in particular. Use of the RBA estimates may improve accuracy and decrease uncertainty in estimating human health risks from exposure to these test soils, as well as increase confidence in computations of site-specific risk-based cleanup levels.

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TABLES AND FIGURES

TABLE 2-1 DOSING PROTOCOL**Study 1**

Group	Number of Animals	Dose Material Administered	Lead Dose ($\mu\text{g}/\text{kg}\cdot\text{day}$)	
			Target	Actual ^a
1	5	Lead Acetate	50	49.4
2	5	Lead Acetate	150	147.7
3	5	Lead Acetate	300	303.8
4	5	Test Material 1	75	72.6
5	5	Test Material 1	225	231.8
6	5	Test Material 1	450	477.1
7	3	Control	0	0.0

Study 2

Group	Number of Animals	Dose Material Administered	Lead Dose ($\mu\text{g}/\text{kg}\cdot\text{day}$)	
			Target	Actual ^a
1	3	Lead Acetate	300	313.6
2	5	Test Material 2	75	77.6
3	5	Test Material 2	225	233.7
4	5	Test Material 2	450	435.4
5	3	Control	0	0.0

^a Calculated as the administered daily dose divided by the measured or extrapolated daily body weight, averaged over days 0-14 for each animal and each group.

Doses were administered in two equal portions given at 9:00 AM and 3:00 PM each day. Doses were based on the mean weight of the animals in each group, and were adjusted every three days to account for weight gain.

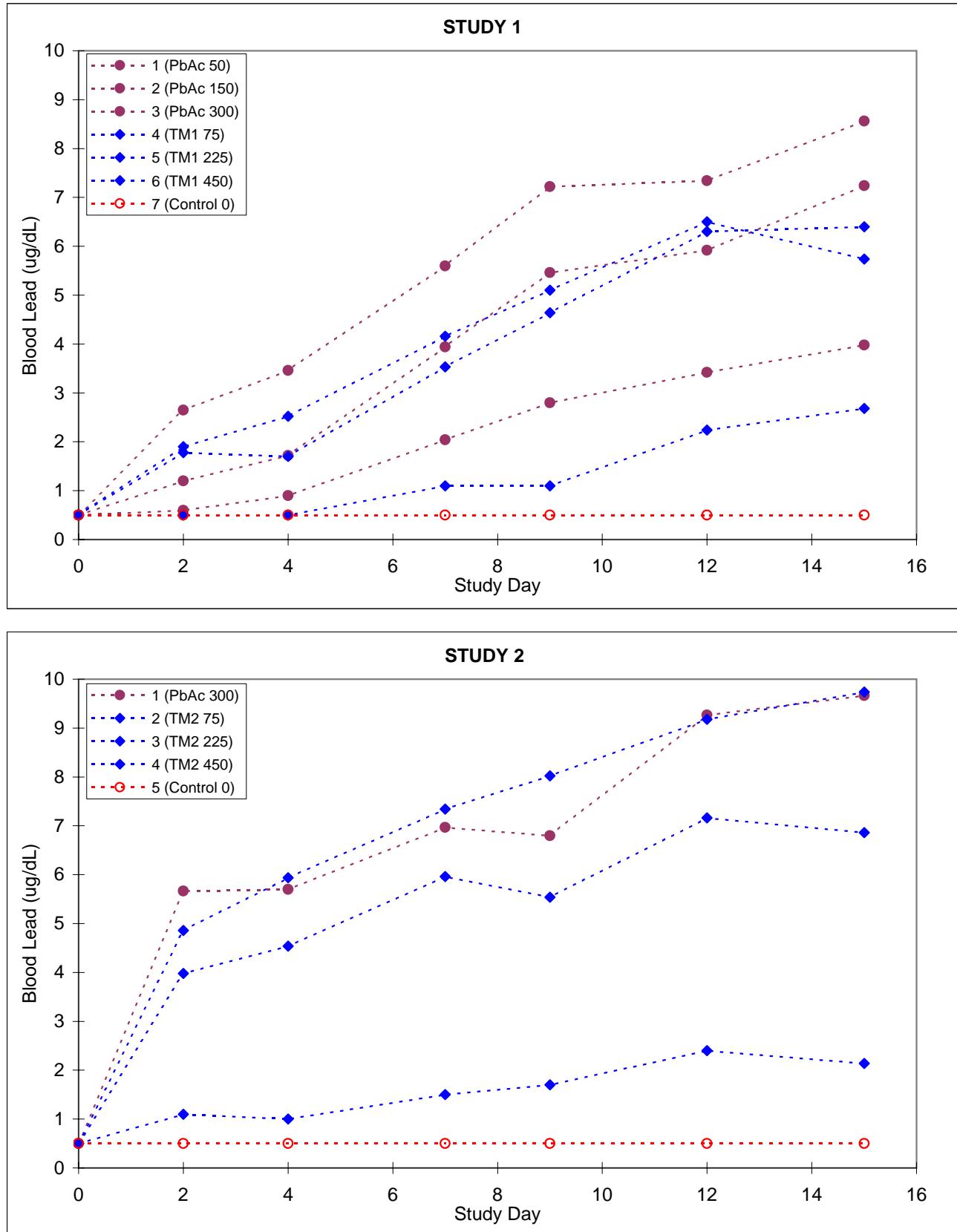
TABLE 2-2 TYPICAL FEED COMPOSITION

Nutrient Name	Amount
Protein	20.1021%
Arginine	1.2070%
Lysine	1.4690%
Methionine	0.8370%
Met+Cys	0.5876%
Tryptophan	0.2770%
Histidine	0.5580%
Leucine	1.8160%
Isoleucine	1.1310%
Phenylalanine	1.1050%
Phe+Tyr	2.0500%
Threonine	0.8200%
Valine	1.1910%
Fat	4.4440%
Saturated Fat	0.5590%
Unsaturated Fat	3.7410%
Linoleic 18:2:6	1.9350%
Linoleic 18:3:3	0.0430%
Crude Fiber	3.8035%
Ash	4.3347%
Calcium	0.8675%
Phos Total	0.7736%
Available Phosphorous	0.7005%
Sodium	0.2448%
Potassium	0.3733%

Nutrient Name	Amount
Chlorine	0.1911%
Magnesium	0.0533%
Sulfur	0.0339%
Manganese	20.4719 ppm
Zinc	118.0608 ppm
Iron	135.3710 ppm
Copper	8.1062 ppm
Cobalt	0.0110 ppm
Iodine	0.2075 ppm
Selenium	0.3196 ppm
Nitrogen Free Extract	60.2340%
Vitamin A	5.1892 kIU/kg
Vitamin D3	0.6486 kIU/kg
Vitamin E	87.2080 IU/kg
Vitamin K	0.9089 ppm
Thiamine	9.1681 ppm
Riboflavin	10.2290 ppm
Niacin	30.1147 ppm
Pantothenic Acid	19.1250 ppm
Choline	1019.8600 ppm
Pyridoxine	8.2302 ppm
Folacin	2.0476 ppm
Biotin	0.2038 ppm
Vitamin B12	23.4416 ppm

Feed obtained from and nutritional values provided by Zeigler Bros., Inc

FIGURE 4-1 GROUP MEAN BLOOD LEAD BY DAY



Individual blood lead outliers excluded.

FIGURE 4-2 VARIANCE MODELS (STUDY 1)

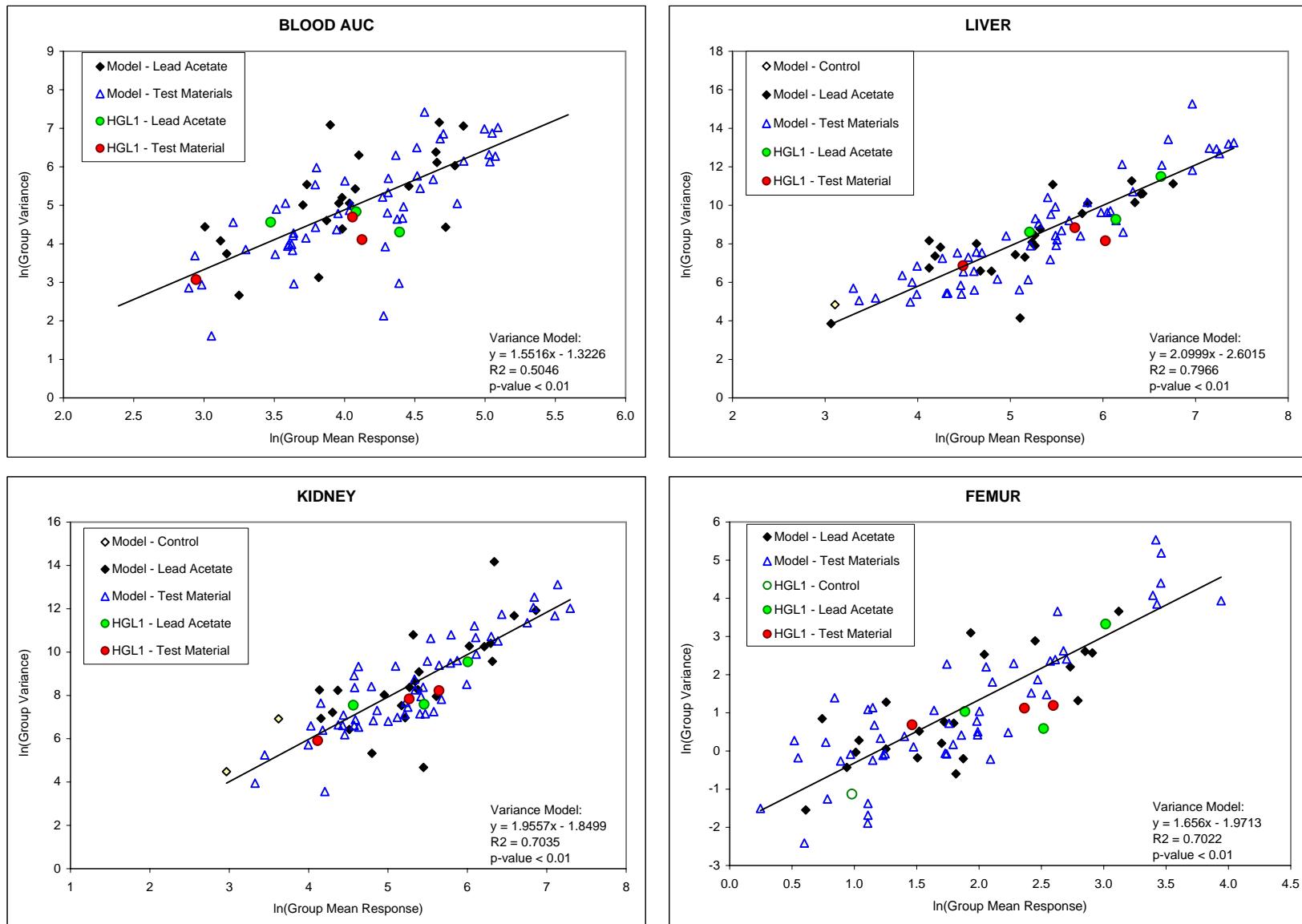


FIGURE 4-3 VARIANCE MODELS (STUDY 2)

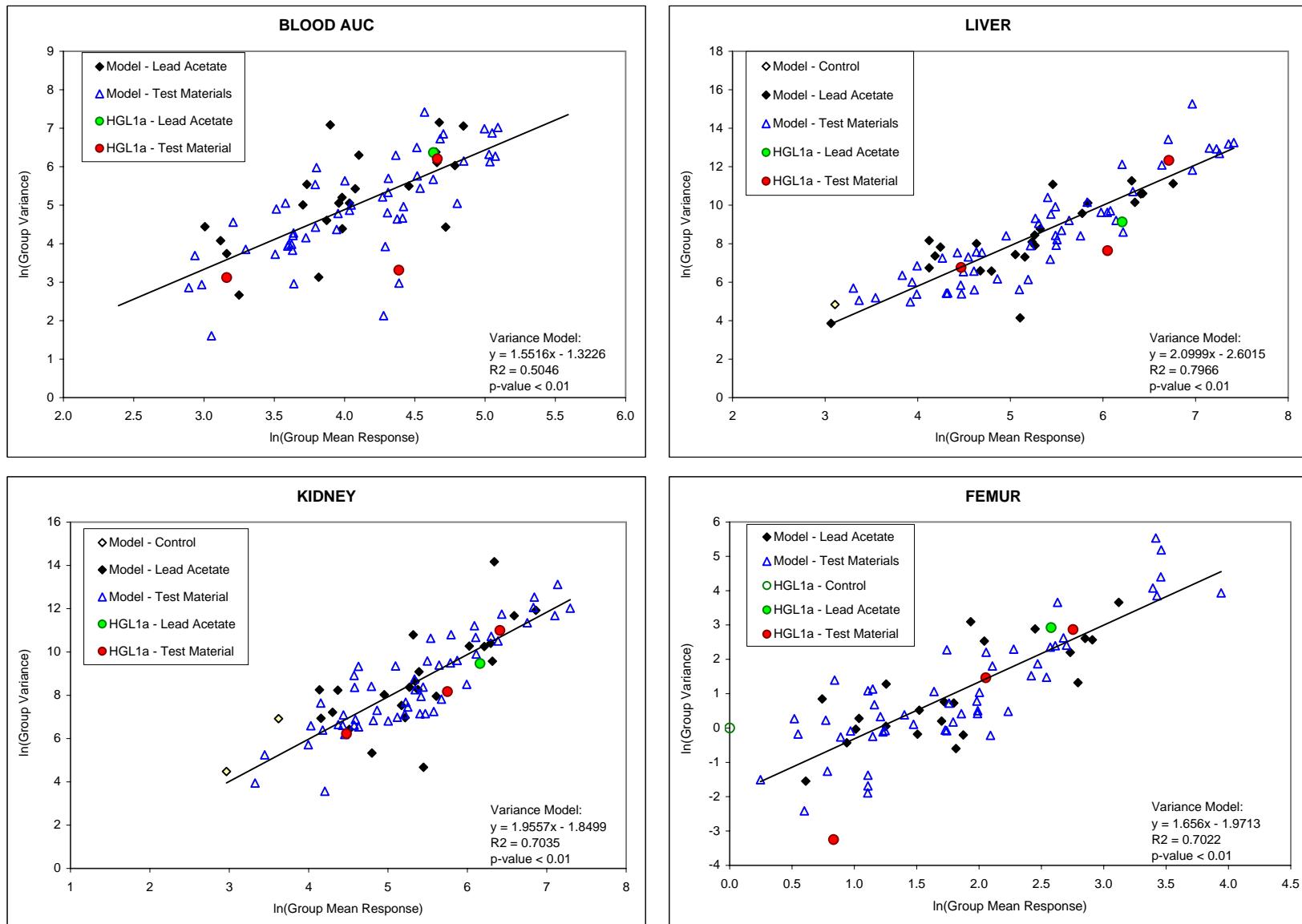
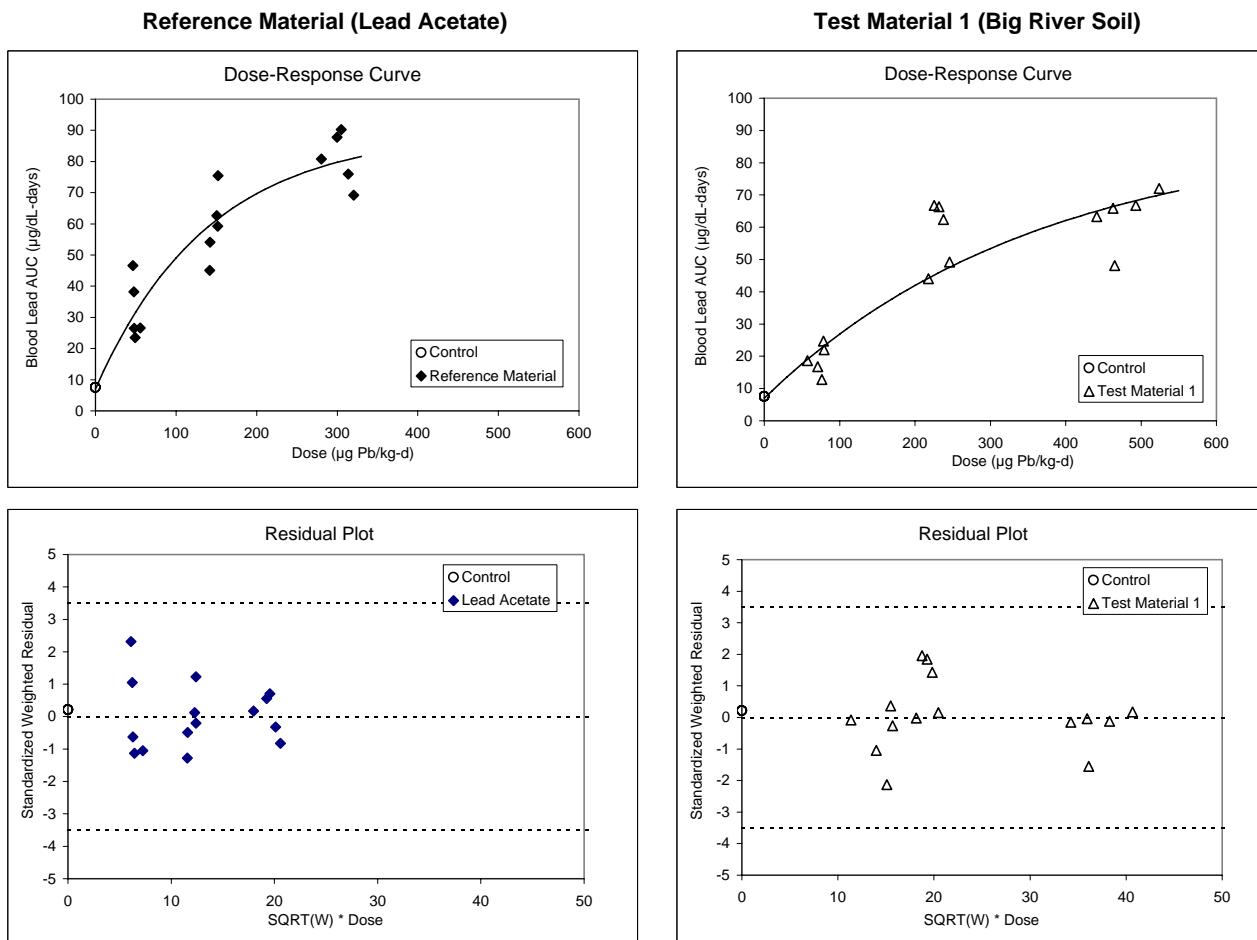


FIGURE 4-4 BLOOD LEAD AUC DOSE-RESPONSE: STUDY 1



Summary of Fitting^a

Parameter	Estimate	Standard Error
a	7.01E+00	1.34E+00
b	8.25E+01	1.10E+01
c _r	7.13E-03	1.89E-03
c _{t1}	2.76E-03	6.56E-04
c _{t2}	--	--
Covariance (c _r , c _{t1})	0.8134	--
Covariance (c _r , c _{t2})	--	--
Degrees of Freedom	29	--

$$^a y = a + b \cdot (1 - \exp(-c_r \cdot x_r)) + b \cdot (1 - \exp(-c_{t1} \cdot x_{t1}))$$

ANOVA

Source	MSE
Fit	157.97
Error	0.91
Total	10.72

Statistic	Estimate
F	174.147
p	< 0.001
Adjusted R ²	0.9154

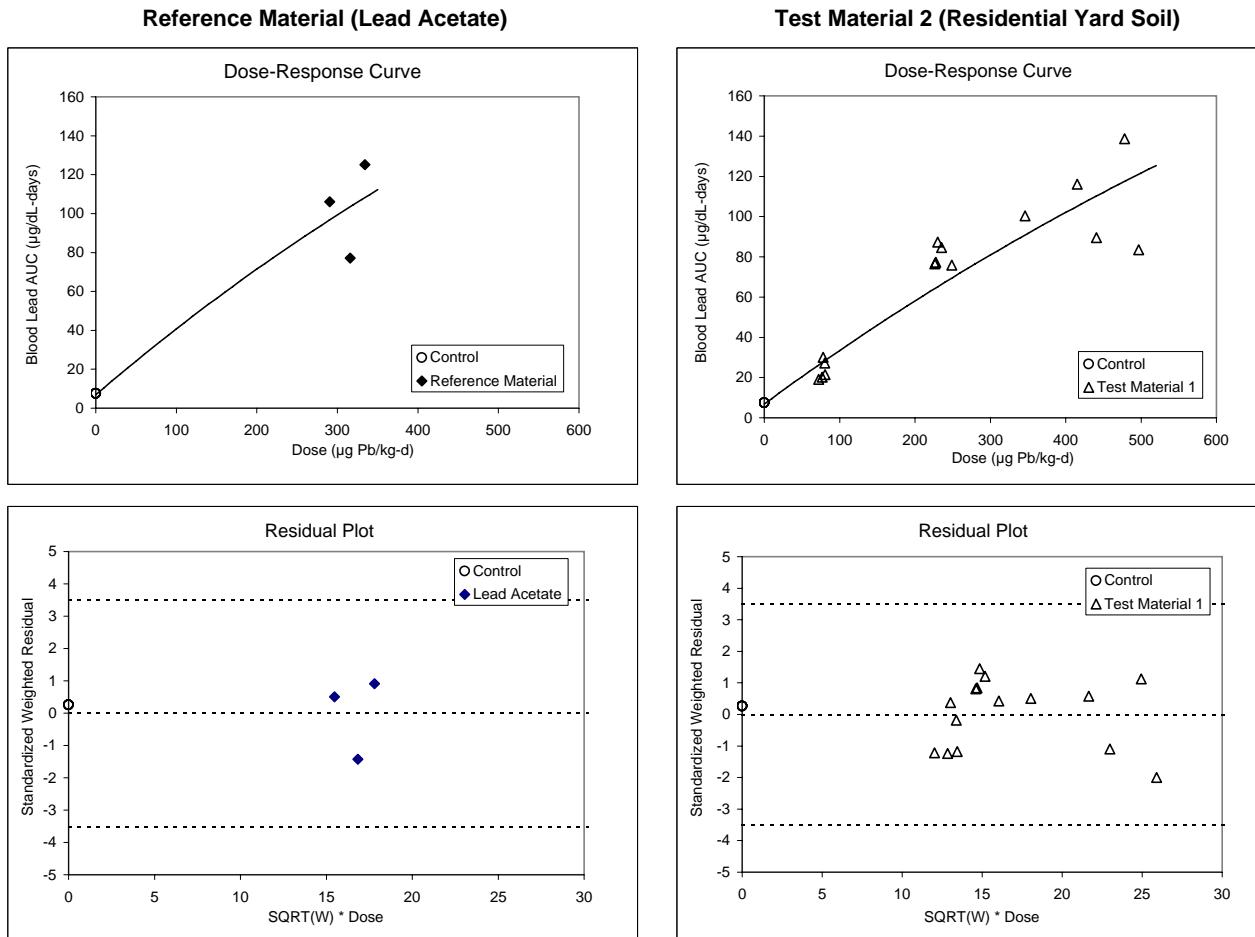
RBA and Uncertainty

	Test Material 3
RBA	0.39
Lower bound ^b	0.30
Upper bound ^b	0.53
Standard Error ^c	0.060*

^c Calculated using Fieller's theorem

* g ≥ 0.05, estimate is uncertain

FIGURE 4-5 BLOOD LEAD AUC DOSE-RESPONSE: STUDY 2



Summary of Fitting^a

Parameter	Estimate	Standard Error
a	6.87E+00	1.50E+00
b	3.63E+02	3.93E+02
c _r	9.78E-04	1.25E-03
c _{t1}	7.59E-04	9.32E-04
c _{t2}	--	--
Covariance (c _r , c _{t1})	0.9921	--
Covariance (c _r , c _{t2})	--	--
Degrees of Freedom	17	--

$$^a y = a + b \cdot (1 - \exp(-c_r \cdot x_r)) + b \cdot (1 - \exp(-c_{t1} \cdot x_{t1}))$$

ANOVA

Source	MSE
Fit	147.70
Error	1.07
Total	15.74

Statistic	Estimate
F	137.679
p	< 0.001
Adjusted R ²	0.9318

RBA and Uncertainty

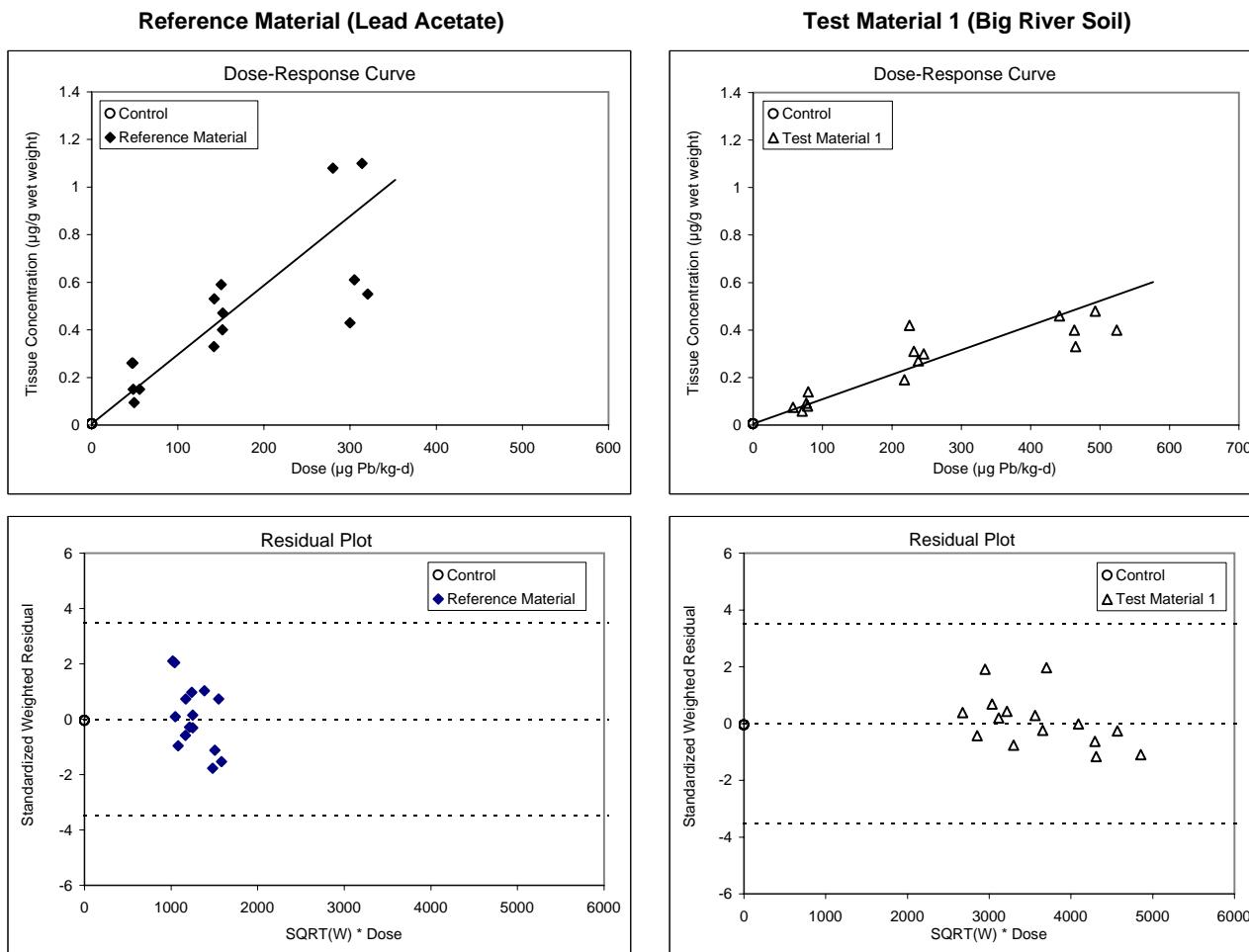
	Test Material 3
RBA	0.78
Lower bound ^b	--
Upper bound ^b	--
Standard Error ^c	0.130*

^b Upper and lower bounds could not be calculated, as Fieller's theorem failed

^c Calculated using Fieller's theorem

* g ≥ 0.05, estimate is uncertain

FIGURE 4-6 LIVER LEAD DOSE-RESPONSE: STUDY 1



Summary of Fitting^a

Parameter	Estimate	Standard Error
a	5.06E-03	7.77E-04
b _r	2.91E-03	2.60E-04
b _{t1}	1.04E-03	9.08E-05
b _{t2}	--	--
Covariance (b _r , b _{t1})	0.0013	--
Covariance (b _r , b _{t2})	--	--
Degrees of Freedom	30	--

$$^a y = a + b_r x_r + b_{t1} x_{t1}$$

ANOVA

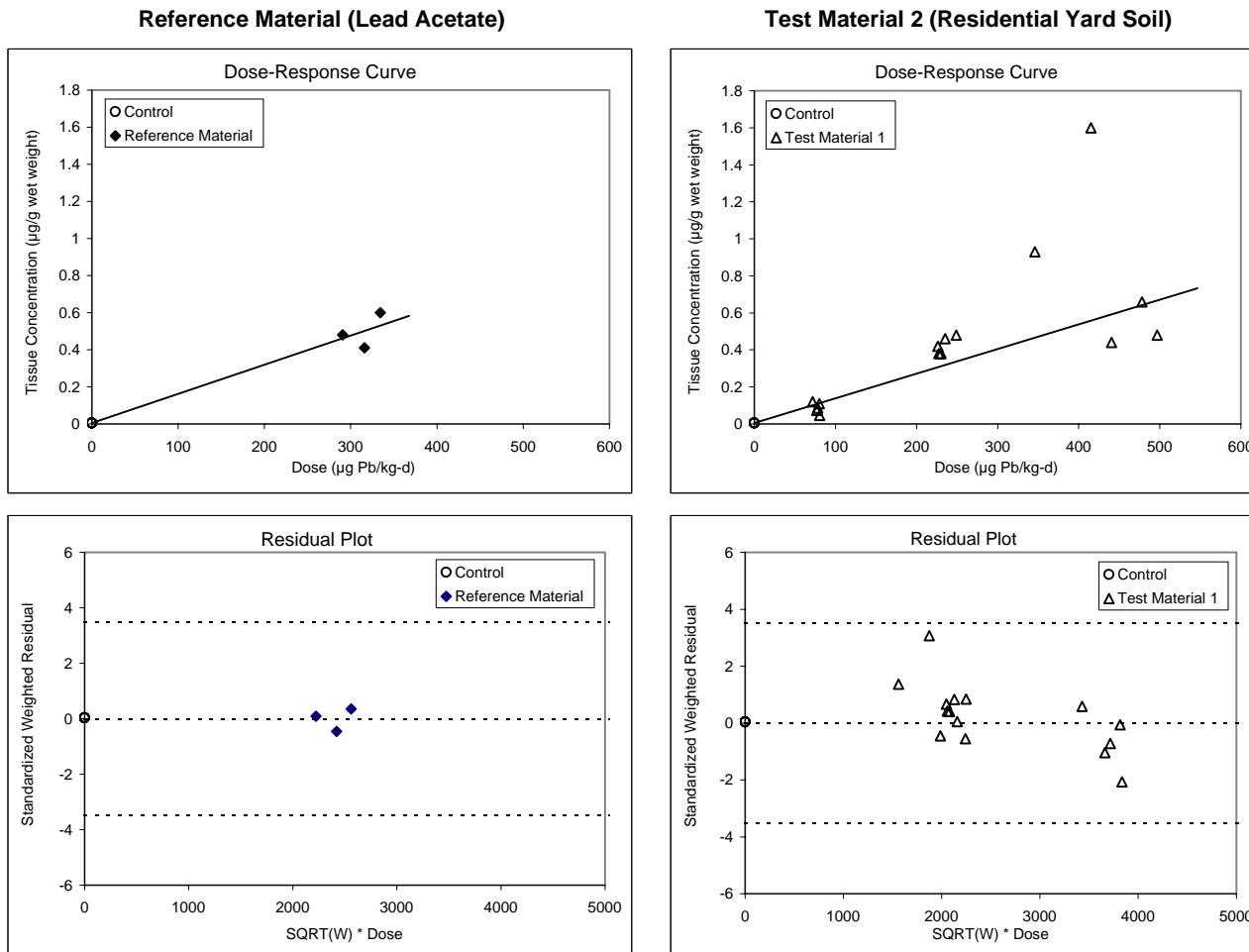
Source	MSE
Fit	211.50
Error	1.66
Total	14.78
Statistic	Estimate
F	127.194
p	< 0.001
Adjusted R ²	0.8875

RBA and Uncertainty

	Test Material 3
RBA	0.36
Lower bound ^b	0.29
Upper bound ^b	0.44
Standard Error ^b	0.045

^b Calculated using Fieller's theorem

FIGURE 4-7 LIVER LEAD DOSE-RESPONSE: STUDY 2



Summary of Fitting^a

Parameter	Estimate	Standard Error
a	4.94E-03	9.87E-04
b _r	1.57E-03	3.93E-04
b _{t1}	1.33E-03	1.56E-04
b _{t2}	--	--
Covariance (b _r , b _{t1})	0.0005	--
Covariance (b _r , b _{t2})	--	--
Degrees of Freedom	18	--

$$^a y = a + b_r x_r + b_{t1} x_{t1}$$

ANOVA

Source	MSE
Fit	118.96
Error	2.68
Total	14.30
Statistic	Estimate
F	44.456
p	< 0.001
Adjusted R ²	0.8129

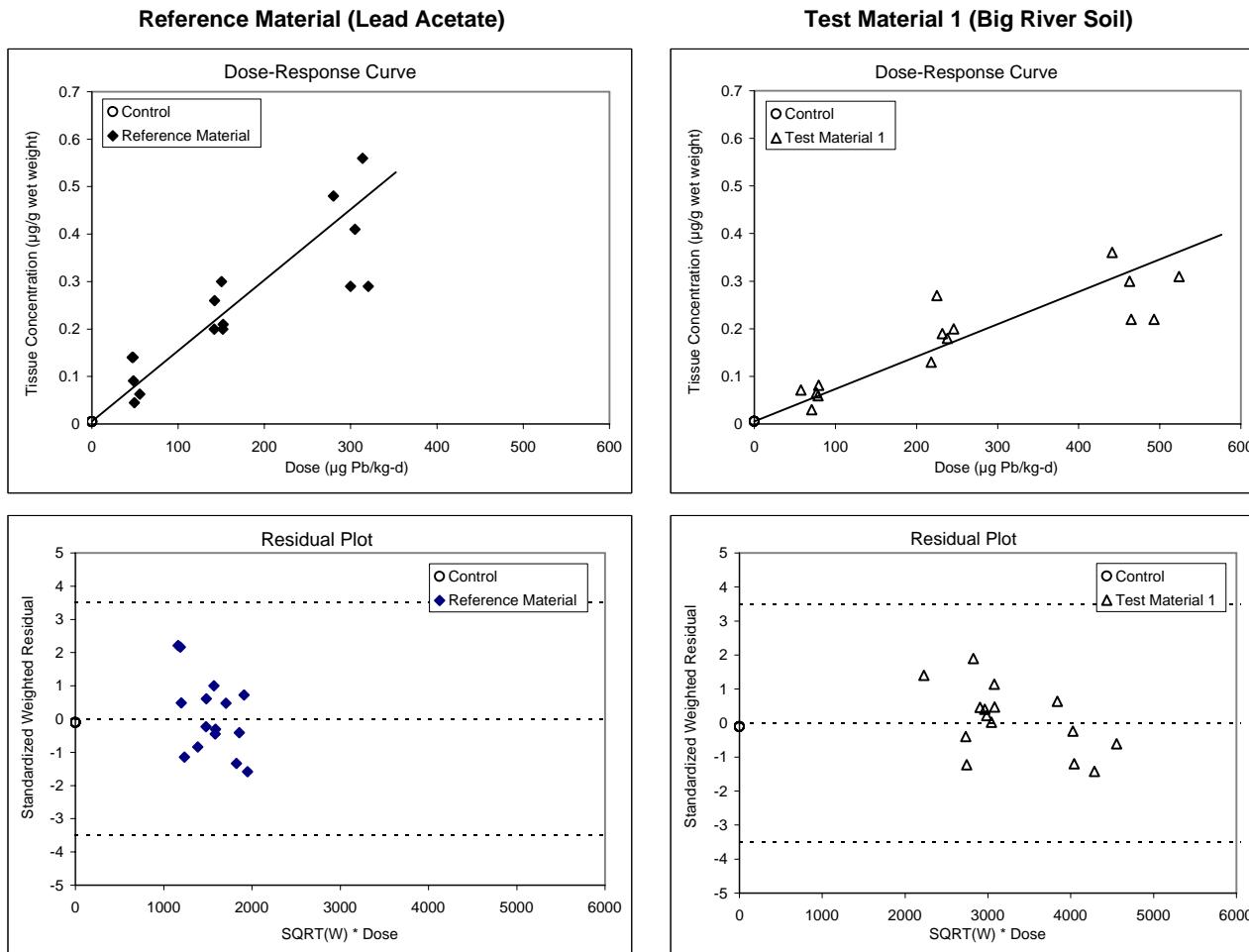
RBA and Uncertainty

	Test Material 3
RBA	0.85
Lower bound ^b	0.55
Upper bound ^b	1.54
Standard Error ^b	0.234*

^b Calculated using Fieller's theorem

* g ≥ 0.05, estimate is uncertain

FIGURE 4-8 KIDNEY LEAD DOSE-RESPONSE: STUDY 1



Summary of Fitting^a

Parameter	Estimate	Standard Error
a	5.17E-03	9.81E-04
b _r	1.49E-03	1.27E-04
b _{t1}	6.81E-04	5.92E-05
b _{t2}	--	--
Covariance (b _r , b _{t1})	0.0055	--
Covariance (b _r , b _{t2})	--	--
Degrees of Freedom	30	--

$$^a y = a + b_r x_r + b_{t1} x_{t1}$$

ANOVA

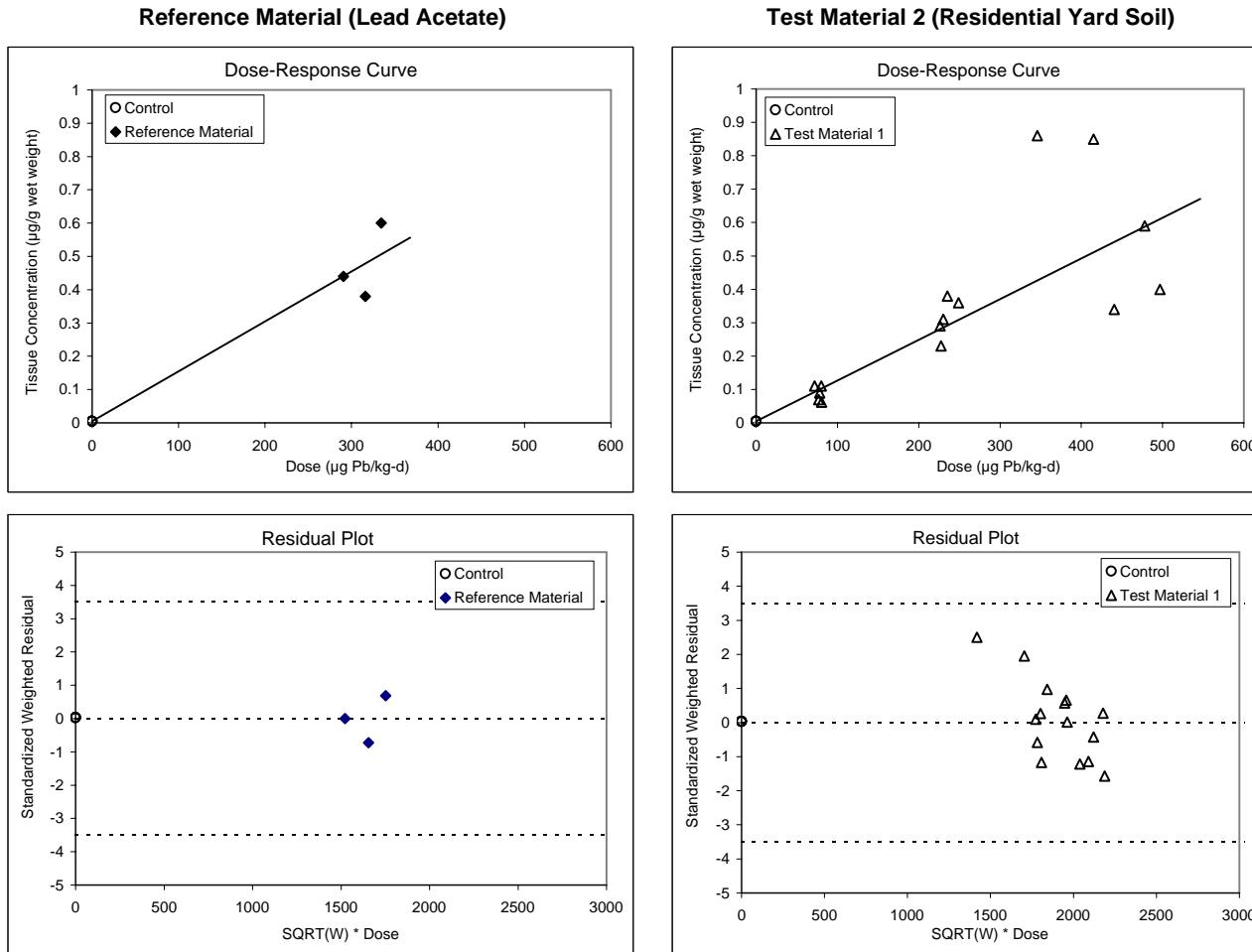
Source	MSE
Fit	78.87
Error	0.59
Total	5.48
Statistic	Estimate
F	134.710
p	< 0.001
Adjusted R ²	0.8931

RBA and Uncertainty

	Test Material 3
RBA	0.46
Lower bound ^b	0.37
Upper bound ^b	0.56
Standard Error ^b	0.055

^b Calculated using Fieller's theorem

FIGURE 4-9 KIDNEY LEAD DOSE-RESPONSE: STUDY 2



Summary of Fitting^a

Parameter	Estimate	Standard Error
a	4.95E-03	9.65E-04
b _r	1.50E-03	2.63E-04
b _{t1}	1.22E-03	1.01E-04
b _{t2}	--	--
Covariance (b _r , b _{t1})	0.0008	--
Covariance (b _r , b _{t2})	--	--
Degrees of Freedom	18	--

$$^a y = a + b_r x_r + b_{t1} x_{t1}$$

ANOVA

Source	MSE
Fit	49.91
Error	0.56
Total	5.50
Statistic	Estimate
F	88.576
p	< 0.001
Adjusted R ²	0.8975

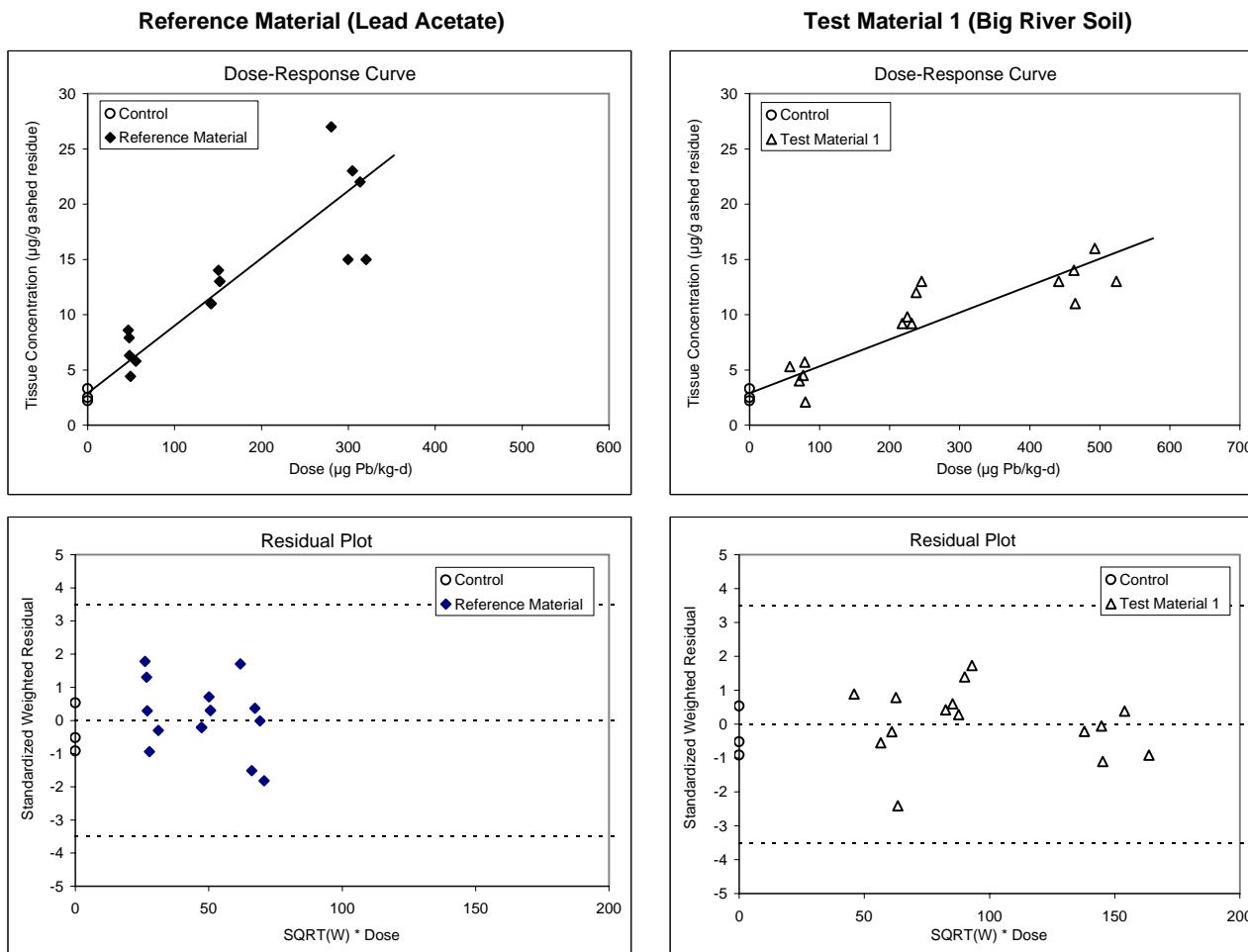
RBA and Uncertainty

	Test Material 3
RBA	0.81
Lower bound ^b	0.60
Upper bound ^b	1.20
Standard Error ^b	0.158*

^b Calculated using Fieller's theorem

* g ≥ 0.05, estimate is uncertain

FIGURE 4-10 FEMUR LEAD DOSE-RESPONSE: STUDY 1



Summary of Fitting^a

Parameter	Estimate	Standard Error
a	2.90E+00	3.48E-01
b _r	6.11E-02	5.21E-03
b _{t1}	2.43E-02	2.64E-03
b _{t2}	--	--
Covariance (b _r , b _{t1})	0.2019	--
Covariance (b _r , b _{t2})	--	--
Degrees of Freedom	30	--

$$^a y = a + b_r x_r + b_{t1} x_{t1}$$

ANOVA

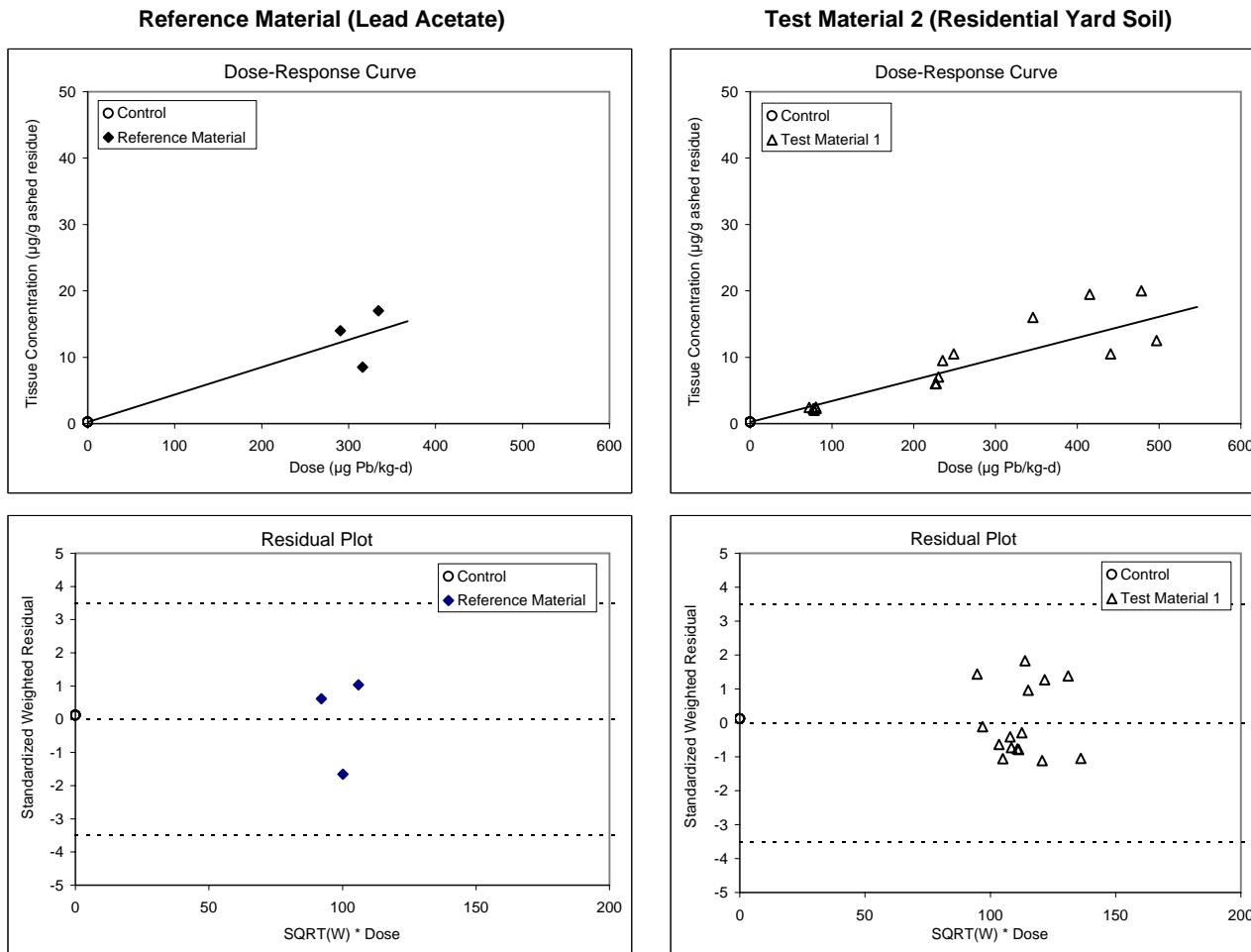
Source	MSE
Fit	81.37
Error	0.87
Total	5.90
Statistic	Estimate
F	93.175
p	< 0.001
Adjusted R ²	0.8521

RBA and Uncertainty

	Test Material 3
RBA	0.40
Lower bound ^b	0.32
Upper bound ^b	0.49
Standard Error ^b	0.049

^b Calculated using Fieller's theorem

FIGURE 4-11 FEMUR LEAD DOSE-RESPONSE: STUDY 2



Summary of Fitting^a

Parameter	Estimate	Standard Error
a	2.37E-01	6.51E-02
b _r	4.13E-02	5.57E-03
b _{t1}	3.17E-02	2.23E-03
b _{t2}	--	--
Covariance (b _r , b _{t1})	0.0065	--
Covariance (b _r , b _{t2})	--	--
Degrees of Freedom	18	--

$$^a y = a + b_r \cdot x_r + b_{t1} \cdot x_{t1}$$

ANOVA

Source	MSE
Fit	118.39
Error	0.92
Total	12.67
Statistic	Estimate
F	128.284
p	< 0.001
Adjusted R ²	0.9272

RBA and Uncertainty

	Test Material 3
RBA	0.77
Lower bound ^b	0.60
Upper bound ^b	1.03
Standard Error ^b	0.117*

^b Calculated using Fieller's theorem

* g ≥ 0.05, estimate is uncertain

APPENDIX A

DETAILED RESULTS FOR STUDY 1

TABLE A-1 SCHEDULE

Study Day	Day	Date	Bleed	Dose Administration	Feed Special Diet	Weigh	Dose Prep	Cull Pigs/ Assign Dose Group	Sacrifice/ Necropsy
-5	Wednesday	1/25/06			transition	X		Cull Pigs	
-4	Thursday	1/26/06			transition			Assign Dose Groups	
-3	Friday	1/27/06			X				
-2	Saturday	1/28/06			X				
-1	Sunday	1/29/06			X	X	X		
0	Monday	1/30/06	X	X	X				
1	Tuesday	1/31/06		X	X				
2	Wednesday	2/1/06	X	X	X	X	X		
3	Thursday	2/2/06		X	X				
4	Friday	2/3/06	X	X	X				
5	Saturday	2/4/06		X	X	X	X		
6	Sunday	2/5/06		X	X				
7	Monday	2/6/06	X	X	X				
8	Tuesday	2/7/06		X	X	X	X		
9	Wednesday	2/8/06	X	X	X				
10	Thursday	2/9/06		X	X				
11	Friday	2/10/06		X	X	X	X		
12	Saturday	2/11/06	X	X	X				
13	Sunday	2/12/06		X	X				
14	Monday	2/13/06		X	X	X			
15	Tuesday	2/14/06	X						X

TABLE A-2 GROUP ASSIGNMENTS

Pig Number	Dose Group	Material Administered	Target Dose of Lead ($\mu\text{g/kg-day}$)
309			
312			
328	1	Lead Acetate	50
346			
354			
313			
331			
349	2	Lead Acetate	150
359			
364			
333			
340			
353	3	Lead Acetate	300
361			
369			
304			
330			
337	4	Test Material 1	75
350			
366			
323			
355			
363	5	Test Material 1	225
365			
367			
302			
316			
322	6	Test Material 1	450
329			
368			
317			
336	7	Control	0
360			

TABLE A-3 BODY WEIGHTS AND ACTUAL ADMINISTERED DOSES, BY DAY

Body weights were measured on days -1, 2, 5, 8, 11, and 14. Weights for other days are estimated, based on linear interpolation between measured values.

Group	Pig #	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day -1	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 0	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 1	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 2	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 3	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 4	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 5	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 6	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 7	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 8	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 9	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 10	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 11	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 12	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 13	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Day 14	BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)	Days 0-14 Mean Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)
1	309	9.1	0.00	9.5	30.13	9.8	58.02	10.2	55.93	10.3	60.73	10.4	60.24	10.5	59.76	11.0	59.82	11.5	57.21	12.0	54.81	12.4	57.99	12.9	55.82	13.4	53.81	13.8	57.36	14.3	55.62	14.7	53.98	55.41																		
1	312	10.7	0.00	11.1	25.81	11.4	50.04	11.8	48.55	11.8	52.77	11.9	52.41	12.0	52.04	12.4	52.82	12.8	51.17	13.2	49.62	13.7	52.69	14.2	50.89	14.7	52.44	15.6	50.92	16.1	49.44	49.39																				
1	328	10.5	0.00	10.9	26.09	11.4	50.19	11.8	48.35	12.0	52.11	12.2	51.33	12.4	50.57	12.9	50.97	13.4	49.06	13.9	47.29	14.4	50.0	15.0	48.12	15.6	46.37	16.1	49.44	16.6	47.95	17.1	46.54	47.63																		
1	346	10.4	0.00	10.8	26.45	11.2	51.09	11.6	49.39	11.9	52.48	12.3	50.98	12.6	49.56	13.0	50.26	13.5	48.64	13.9	47.12	14.4	50.24	14.8	48.72	15.3	47.23	15.7	50.65	16.1	49.34	16.5	48.09	48.02																		
1	354	11.4	0.00	11.6	24.56	11.9	48.01	12.2	46.95	12.5	50.09	12.8	48.85	13.1	47.67	13.5	48.64	13.8	47.35	14.2	46.13	14.6	49.27	15.1	47.85	15.5	46.52	15.9	50.06	16.2	48.98	16.6	47.95	46.59																		
2	313	9.6	0.00	9.9	85.14	10.2	164.98	10.5	160.00	10.8	166.94	11.1	162.43	11.4	158.16	11.9	161.65	12.3	155.73	12.8	150.24	13.3	159.34	13.8	153.18	14.4	147.49	14.9	157.55	15.5	151.94	16.0	146.72	152.10																		
2	331	9.9	0.00	10.2	82.62	10.5	160.25	10.8	155.56	11.0	163.66	11.2	160.50	11.5	157.47	11.9	160.74	12.4	154.68	12.9	149.07	13.4	158.14	13.9	152.08	14.5	146.47	15.0	156.85	15.5	151.61	16.0	146.72	150.43																		
2	349	10.4	0.00	10.5	80.00	10.7	157.75	10.8	155.56	11.1	162.92	11.3	159.09	11.6	155.43	12.0	160.07	12.3	155.31	12.7	150.83	13.1	161.15	13.6	156.01	14.0	151.18	14.5	162.46	14.9	157.55	15.4	152.93	151.88																		
2	359	10.3	0.00	10.7	78.87	11.0	152.73	11.4	148.02	11.7	154.76	12.0	150.88	12.3	147.18	12.7	150.43	13.2	144.93	13.7	139.82	14.3	148.35	14.8	142.69	15.4	148.11	16.3	144.02	16.8	140.15	141.89																				
2	364	11.0	0.00	11.2	75.11	11.4	147.15	11.7	144.21	11.8	152.58	12.0	150.46	12.2	148.40	12.6	151.82	13.1	146.41	13.6	141.37	14.1	150.64	14.6	145.46	15.1	140.63	15.6	150.96	16.1	146.26	16.6	141.84	142.22																		
3	333	9.7	0.00	9.9	252.05	10.2	327.78	10.4	319.90	10.8	334.88	11.1	324.32	11.5	314.41	11.8	328.77	12.2	318.88	12.6	309.56	13.0	324.32	13.5	312.73	14.0	301.93	14.4	320.72	14.9	311.37	15.3	302.55	313.61																		
3	340	10.1	0.00	10.3	241.87	10.6	314.36	10.9	306.64	11.3	319.05	11.7	307.25	12.2	296.30	12.5	311.21	12.8	303.12	13.2	295.44	13.6	310.43	14.1	300.14	14.6	290.52	15.0	308.60	15.5	299.61	299.71																				
3	353	9.8	0.00	10.2	244.23	10.6	312.88	11.1	301.09	11.3	319.53	11.5	313.50	11.7	307.69	12.2	319.75	12.6	308.33	13.1	297.70	13.4	315.06	13.8	306.67	14.2	298.73	14.6	317.78	15.0	308.94	15.4	300.58	304.83																		
3	361	10.2	0.00	10.4	240.31	10.6	313.38	10.9	306.64	11.1	324.81	11.3	318.11	11.6	311.69	11.9	326.93	12.2	318.01	12.6	309.56	13.0	324.32	13.5	312.73	14.0	301.93	14.4	322.58	14.7	314.90	15.1	461.36	320.48																		
3	369	10.8	0.00	11.2	223.79	11.5	289.30	11.9	280.76	12.2	295.08	12.6	286.85	12.9	279.07	13.3	291.74	13.7	282.89	14.2	274.56	14.6	289.85	15.0	273.95	15.5	284.28	16.7	277.19	16.7	280.15	280.15																				
4	304	9.3	0.00	9.6	82.38	10.0	79.48	10.3	76.78	10.7	80.34	11.0	77.67	11.4	75.17	11.9	77.49	12.4	74.46	12.9	71.66	13.3	77.79	13.8	75.15	14.3	72.69	14.7	77.86	15.2	75.39	15.7	73.06	76.49																		
4	330	9.5	0.00	9.7	81.25	10.0	79.35	10.2	77.53	10.4	82.14	10.7	80.34	10.9	78.62	11.4	80.78	11.9	77.38	12.4	74.26	12.9	80.61	13.3	77.88	13.8	75.34	14.3	80.22	14.9	77.25	15.4	74.49	78.50																		
4	337	9.3	0.00	9.6	82.00	10.0	79.35	10.3	76.78	10.6	81.23	10.8	79.35	11.1	77.55	11.5	79.84	12.0	76.63	12.5	73.67	13.0	76.63	13.5	73.67	14.1	76.35	14.6	0.00	15.1	0.00	15.6	57.49																			
4	350	9.5	0.00	9.6	82.66	9.7	81.67	9.8	80.69	10.1	84.85	10.4	82.40	10.7	80.09	11.2	81.97	11.8	78.26	12.3	74.87	12.9	80.51	13.4	77.11	14.0	73.99	14.4	79.66	14.8	77.51	15.2	75.47	79.45																		
4	366	10.1	0.00	10.5	75.08	11.0	72.11	11.4	69.37	11.7	73.45	11.9	71.81	12.2	70.24	12.8	72.22	13.3	69.24	13.9	66.49	14.3	72.44	14.8	70.23	15.2	68.15	15.7	72.99	16.2	70.66	16.8	68.48	70.86																		
5	323	9.2	0.00	9.5	258.04	9.9	248.87	10.2	240.33	10.5	247.28	10.9	239.70	11.2	232.56	11.7	238.43	12.2	228.66	12.7	219.66	13.3	232.03	13.8	222.53	14.4	213.77	15.0	226.22	15.6	217.74	16.2	209.88	231.71																		
5	355	10.3	0.00	10.3	237.61	10.3	237.23	10.4	236.85	10.6	246.11	10.8	240.80	11.1	235.72	11.5	243.63	11.9	235.41	12.3	227.72	12.7	243.34	13.1	235.88	13.5	228.87	13.8	245.91	14.1	240.11	14.5	234.57	237.98																		
5	363	10.5	0.00	10.7	228.39	11.0	222.51	11.3	216.93	11.5	225.84	11.8	221.36	12.0	217.06	12.5	223.77	12.9	215.69	13.4	208.18	13.8	222.53	14.3	215.77	14.7	209.41	15.3	222.02	15.8	214.07	216.4	206.68	218.01																		
5	365	10.0	0.00	10.2	240.72	10.4	235.33	10.7	230.17	11.0	236.79	11.4	229.49	11.7	222.62	12.2	228.97	12.7	220.23	13.2	212.14	13.7	225.51	14.2	217.55	14.7	210.12	14.9	227.23	15.2	223.24	15.5	219.38	225.30																		
5	367	9.5	0.00	9.8	251.42	10.0	245.13	10.3	239.16	10.5	248.86	10.8	243.81	10.9	238.96	11.2	243.28	11.8	237.41	12.2	235.36	12.6	245.28	13.0	237.70	13.2	256.13	13.5	250.76	13.8	245.62	245.76																				
6	302	9.1	0.00	9.5	800.44	9.9	512.89	10.3	493.71	10.5	525.77	10.8	513.54	11.0	501.67	11.3	522.90	11.6	506.67	12.0	495.19	12.4	522.35	12.9	503.43	13.4	485.63	13.9	509.80	14.5	489.85	15.1	471.41	523.84																		
6	316	10.5	0.00	10.8	705.03	11.1	456.59	11.4	443.91	11.8	469.84	12.1	456.25	12.5	443.42	12.9	458.72	13.4	443.26	13.8	428.81	14.3	454.08	14.8	439.22	15.3	425.30	15.5	457.23	15.8	449.51	16.1	442.04	464.88																		
6	322	10.6	0.00	10.8	705.03	11.0	460.75	11.2	451.84	11.5	479.36	11.8	466.																																							

TABLE A-4 ANIMAL HEALTH

Naxcel Treatment for Illness

First Day of Treatment	Treatment Duration	Pig	Group	Indications
Day -5 (1/25/06)	3 days	312	1	Diarrhea, fever, and inappetance
Day -4 (1/26/06)	3 days	313	2	
Day -1 (1/31/06)	3 days	329	6	
		350	4	
Day 3 (2/2/06)	3 days	364	2	
Day 4 (2/3/06)	3 days	309	1	

Animal Deaths

No animals died while on study.

Necropsy Notes

Pig #309 had a small umbilical abscess, about 1/2-inch cubed in size

Pig #331 had a large umbilical abcess, about the size of a lemon

TABLE A-5
LEAD ANALYTICAL RESULTS FOR STUDY SAMPLES

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1-309-(15)-L	HGL1-383	liver	309	1	PbAc	15	55.41	0.15	0	0.15	ug/g	
HGL1-312-(15)-L	HGL1-391	liver	312	1	PbAc	15	49.39	0.094	0	0.094	ug/g	
HGL1-328-(15)-L	HGL1-400	liver	328	1	PbAc	15	47.63	0.26	0	0.26	ug/g	
HGL1-346-(15)-L	HGL1-395	liver	346	1	PbAc	15	48.02	0.15	0	0.15	ug/g	
HGL1-354-(15)-L	HGL1-367	liver	354	1	PbAc	15	46.59	0.26	0	0.26	ug/g	
HGL1-313-(15)-L	HGL1-392	liver	313	2	PbAc	15	152.1	0.47	0	0.47	ug/g	
HGL1-331-(15)-L	HGL1-374	liver	331	2	PbAc	15	150.43	0.59	0	0.59	ug/g	
HGL1-349-(15)-L	HGL1-371	liver	349	2	PbAc	15	151.88	0.4	0	0.4	ug/g	
HGL1-359-(15)-L	HGL1-388	liver	359	2	PbAc	15	141.89	0.33	0	0.33	ug/g	
HGL1-364-(15)-L	HGL1-389	liver	364	2	PbAc	15	142.22	0.53	0	0.53	ug/g	
HGL1-333-(15)-L	HGL1-369	liver	333	3	PbAc	15	313.61	1.1	0.1	1.1	ug/g	
HGL1-340-(15)-L	HGL1-393	liver	340	3	PbAc	15	299.71	0.43	0	0.43	ug/g	
HGL1-353-(15)-L	HGL1-399	liver	353	3	PbAc	15	304.83	0.61	0	0.61	ug/g	
HGL1-361-(15)-L	HGL1-382	liver	361	3	PbAc	15	320.48	0.55	0	0.55	ug/g	
HGL1-369-(15)-L	HGL1-397	liver	369	3	PbAc	15	280.15	1.08	0.1	1.08	ug/g	
HGL1-304-(15)-L	HGL1-373	liver	304	4	TM1	15	76.49	0.092	0	0.092	ug/g	
HGL1-330-(15)-L	HGL1-398	liver	330	4	TM1	15	78.5	0.08	0	0.08	ug/g	
HGL1-337-(15)-L	HGL1-372	liver	337	4	TM1	15	57.49	0.075	0	0.075	ug/g	
HGL1-350-(15)-L	HGL1-370	liver	350	4	TM1	15	79.45	0.14	0	0.14	ug/g	
HGL1-366-(15)-L	HGL1-378	liver	366	4	TM1	15	70.86	0.058	0	0.058	ug/g	
HGL1-323-(15)-L	HGL1-402	liver	323	5	TM1	15	231.71	0.31	0	0.31	ug/g	
HGL1-355-(15)-L	HGL1-384	liver	355	5	TM1	15	237.98	0.27	0	0.27	ug/g	
HGL1-363-(15)-L	HGL1-401	liver	363	5	TM1	15	218.01	0.19	0	0.19	ug/g	
HGL1-365-(15)-L	HGL1-385	liver	365	5	TM1	15	225.3	0.42	0	0.42	ug/g	
HGL1-367-(15)-L	HGL1-379	liver	367	5	TM1	15	245.76	0.3	0	0.3	ug/g	
HGL1-302-(15)-L	HGL1-394	liver	302	6	TM1	15	523.84	0.4	0	0.4	ug/g	
HGL1-316-(15)-L	HGL1-386	liver	316	6	TM1	15	464.88	0.33	0	0.33	ug/g	
HGL1-322-(15)-L	HGL1-375	liver	322	6	TM1	15	462.95	0.4	0	0.4	ug/g	
HGL1-329-(15)-L	HGL1-390	liver	329	6	TM1	15	441.22	0.46	0	0.46	ug/g	
HGL1-368-(15)-L	HGL1-396	liver	368	6	TM1	15	492.79	0.48	0	0.48	ug/g	
HGL1-317-(15)-L	HGL1-368	liver	317	7	Control	15	0	< 0.01	0	0.005	ug/g	
HGL1-336-(15)-L	HGL1-377	liver	336	7	Control	15	0	< 0.01	0	0.005	ug/g	
HGL1-360-(15)-L	HGL1-381	liver	360	7	Control	15	0	< 0.01	0	0.005	ug/g	
HGL1-309-(15)-K	HGL1-418	kidney	309	1	PbAc	15	55.41	0.063	0	0.063	ug/g	
HGL1-312-(15)-K	HGL1-424	kidney	312	1	PbAc	15	49.39	0.045	0	0.045	ug/g	
HGL1-328-(15)-K	HGL1-403	kidney	328	1	PbAc	15	47.63	0.14	0	0.14	ug/g	
HGL1-346-(15)-K	HGL1-426	kidney	346	1	PbAc	15	48.02	0.091	0	0.091	ug/g	
HGL1-354-(15)-K	HGL1-415	kidney	354	1	PbAc	15	46.59	0.14	0	0.14	ug/g	
HGL1-313-(15)-K	HGL1-409	kidney	313	2	PbAc	15	152.1	0.21	0	0.21	ug/g	
HGL1-331-(15)-K	HGL1-437	kidney	331	2	PbAc	15	150.43	0.3	0	0.3	ug/g	
HGL1-349-(15)-K	HGL1-427	kidney	349	2	PbAc	15	151.88	0.2	0	0.2	ug/g	
HGL1-359-(15)-K	HGL1-429	kidney	359	2	PbAc	15	141.89	0.2	0	0.2	ug/g	
HGL1-364-(15)-K	HGL1-414	kidney	364	2	PbAc	15	142.22	0.26	0	0.26	ug/g	
HGL1-333-(15)-K	HGL1-416	kidney	333	3	PbAc	15	313.61	0.56	0	0.56	ug/g	
HGL1-340-(15)-K	HGL1-425	kidney	340	3	PbAc	15	299.71	0.29	0	0.29	ug/g	
HGL1-353-(15)-K	HGL1-411	kidney	353	3	PbAc	15	304.83	0.41	0	0.41	ug/g	
HGL1-361-(15)-K	HGL1-438	kidney	361	3	PbAc	15	320.48	0.29	0	0.29	ug/g	
HGL1-369-(15)-K	HGL1-423	kidney	369	3	PbAc	15	280.15	0.48	0	0.48	ug/g	
HGL1-304-(15)-K	HGL1-419	kidney	304	4	TM1	15	76.49	0.065	0	0.065	ug/g	
HGL1-330-(15)-K	HGL1-410	kidney	330	4	TM1	15	78.5	0.059	0	0.059	ug/g	
HGL1-337-(15)-K	HGL1-404	kidney	337	4	TM1	15	57.49	0.071	0	0.071	ug/g	
HGL1-350-(15)-K	HGL1-434	kidney	350	4	TM1	15	79.45	0.081	0	0.081	ug/g	
HGL1-366-(15)-K	HGL1-428	kidney	366	4	TM1	15	70.86	0.03	0	0.03	ug/g	
HGL1-323-(15)-K	HGL1-408	kidney	323	5	TM1	15	231.71	0.19	0	0.19	ug/g	
HGL1-355-(15)-K	HGL1-417	kidney	355	5	TM1	15	237.98	0.18	0	0.18	ug/g	
HGL1-363-(15)-K	HGL1-420	kidney	363	5	TM1	15	218.01	0.13	0	0.13	ug/g	
HGL1-365-(15)-K	HGL1-432	kidney	365	5	TM1	15	225.3	0.27	0	0.27	ug/g	
HGL1-367-(15)-K	HGL1-421	kidney	367	5	TM1	15	245.76	0.2	0	0.2	ug/g	
HGL1-302-(15)-K	HGL1-405	kidney	302	6	TM1	15	523.84	0.31	0	0.31	ug/g	
HGL1-316-(15)-K	HGL1-436	kidney	316	6	TM1	15	464.88	0.22	0	0.22	ug/g	
HGL1-322-(15)-K	HGL1-435	kidney	322	6	TM1	15	462.95	0.3	0	0.3	ug/g	
HGL1-329-(15)-K	HGL1-430	kidney	329	6	TM1	15	441.22	0.36	0	0.36	ug/g	
HGL1-368-(15)-K	HGL1-422	kidney	368	6	TM1	15	492.79	0.22	0	0.22	ug/g	

TABLE A-5

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1-317-(15)-K	HGL1-406	kidney	317	7	Control	15	0	< 0.01	0	0.005	ug/g	
HGL1-336-(15)-K	HGL1-413	kidney	336	7	Control	15	0	< 0.01	0	0.005	ug/g	
HGL1-360-(15)-K	HGL1-407	kidney	360	7	Control	15	0	< 0.01	0	0.005	ug/g	
HGL1-309-(15)-F	HGL1-462	femur	309	1	PbAc	15	55.41	5.8	0.5	5.8	ug/g	
HGL1-312-(15)-F	HGL1-450	femur	312	1	PbAc	15	49.39	4.4	0.5	4.4	ug/g	
HGL1-328-(15)-F	HGL1-459	femur	328	1	PbAc	15	47.63	7.9	0.5	7.9	ug/g	
HGL1-346-(15)-F	HGL1-471	femur	346	1	PbAc	15	48.02	6.3	0.5	6.3	ug/g	
HGL1-354-(15)-F	HGL1-473	femur	354	1	PbAc	15	46.59	8.6	0.5	8.6	ug/g	
HGL1-313-(15)-F	HGL1-467	femur	313	2	PbAc	15	152.1	13	0.5	13	ug/g	
HGL1-331-(15)-F	HGL1-447	femur	331	2	PbAc	15	150.43	14	0.5	14	ug/g	
HGL1-349-(15)-F	HGL1-444	femur	349	2	PbAc	15	151.88	13	0.5	13	ug/g	
HGL1-359-(15)-F	HGL1-469	femur	359	2	PbAc	15	141.89	11	0.5	11	ug/g	
HGL1-364-(15)-F	HGL1-453	femur	364	2	PbAc	15	142.22	11	0.5	11	ug/g	
HGL1-333-(15)-F	HGL1-445	femur	333	3	PbAc	15	313.61	22	1	22	ug/g	
HGL1-340-(15)-F	HGL1-442	femur	340	3	PbAc	15	299.71	15	0.5	15	ug/g	
HGL1-353-(15)-F	HGL1-439	femur	353	3	PbAc	15	304.83	23	1	23	ug/g	
HGL1-361-(15)-F	HGL1-452	femur	361	3	PbAc	15	320.48	15	0.5	15	ug/g	
HGL1-369-(15)-F	HGL1-460	femur	369	3	PbAc	15	280.15	27	1	27	ug/g	
HGL1-304-(15)-F	HGL1-455	femur	304	4	TM1	15	76.49	4.5	0.5	4.5	ug/g	
HGL1-330-(15)-F	HGL1-472	femur	330	4	TM1	15	78.5	5.7	0.5	5.7	ug/g	
HGL1-337-(15)-F	HGL1-443	femur	337	4	TM1	15	57.49	5.3	0.5	5.3	ug/g	
HGL1-350-(15)-F	HGL1-454	femur	350	4	TM1	15	79.45	2.1	0.5	2.1	ug/g	
HGL1-366-(15)-F	HGL1-449	femur	366	4	TM1	15	70.86	4	0.5	4	ug/g	
HGL1-323-(15)-F	HGL1-446	femur	323	5	TM1	15	231.71	9.2	0.5	9.2	ug/g	
HGL1-355-(15)-F	HGL1-451	femur	355	5	TM1	15	237.98	12	0.5	12	ug/g	
HGL1-363-(15)-F	HGL1-461	femur	363	5	TM1	15	218.01	9.2	0.5	9.2	ug/g	
HGL1-365-(15)-F	HGL1-464	femur	365	5	TM1	15	225.3	9.8	0.5	9.8	ug/g	
HGL1-367-(15)-F	HGL1-466	femur	367	5	TM1	15	245.76	13	0.5	13	ug/g	
HGL1-302-(15)-F	HGL1-448	femur	302	6	TM1	15	523.84	13	0.5	13	ug/g	
HGL1-316-(15)-F	HGL1-441	femur	316	6	TM1	15	464.88	11	0.5	11	ug/g	
HGL1-322-(15)-F	HGL1-470	femur	322	6	TM1	15	462.95	14	0.5	14	ug/g	
HGL1-329-(15)-F	HGL1-457	femur	329	6	TM1	15	441.22	13	0.5	13	ug/g	
HGL1-368-(15)-F	HGL1-465	femur	368	6	TM1	15	492.79	16	0.5	16	ug/g	
HGL1-317-(15)-F	HGL1-458	femur	317	7	Control	15	0	3.3	0.5	3.3	ug/g	
HGL1-336-(15)-F	HGL1-463	femur	336	7	Control	15	0	2.2	0.5	2.2	ug/g	
HGL1-360-(15)-F	HGL1-456	femur	360	7	Control	15	0	2.5	0.5	2.5	ug/g	
HGL1-309-(0)-B	HGL1-120	blood	309	1	PbAc	0	30.13	< 1	1	0.5	ug/dL	
HGL1-312-(0)-B	HGL1-130	blood	312	1	PbAc	0	25.81	< 1	1	0.5	ug/dL	
HGL1-328-(0)-B	HGL1-113	blood	328	1	PbAc	0	26.09	< 1	1	0.5	ug/dL	
HGL1-346-(0)-B	HGL1-115	blood	346	1	PbAc	0	26.45	< 1	1	0.5	ug/dL	
HGL1-354-(0)-B	HGL1-138	blood	354	1	PbAc	0	24.56	< 1	1	0.5	ug/dL	
HGL1-313-(0)-B	HGL1-116	blood	313	2	PbAc	0	85.14	< 1	1	0.5	ug/dL	
HGL1-331-(0)-B	HGL1-101	blood	331	2	PbAc	0	82.62	< 1	1	0.5	ug/dL	
HGL1-349-(0)-B	HGL1-104	blood	349	2	PbAc	0	80	< 1	1	0.5	ug/dL	
HGL1-359-(0)-B	HGL1-118	blood	359	2	PbAc	0	78.87	< 1	1	0.5	ug/dL	
HGL1-364-(0)-B	HGL1-112	blood	364	2	PbAc	0	75.11	< 1	1	0.5	ug/dL	
HGL1-333-(0)-B	HGL1-121	blood	333	3	PbAc	0	252.05	< 1	1	0.5	ug/dL	
HGL1-340-(0)-B	HGL1-122	blood	340	3	PbAc	0	241.87	< 1	1	0.5	ug/dL	
HGL1-353-(0)-B	HGL1-105	blood	353	3	PbAc	0	244.23	< 1	1	0.5	ug/dL	
HGL1-361-(0)-B	HGL1-111	blood	361	3	PbAc	0	240.31	< 1	1	0.5	ug/dL	
HGL1-369-(0)-B	HGL1-119	blood	369	3	PbAc	0	223.79	< 1	1	0.5	ug/dL	
HGL1-304-(0)-B	HGL1-129	blood	304	4	TM1	0	82.38	< 1	1	0.5	ug/dL	
HGL1-330-(0)-B	HGL1-135	blood	330	4	TM1	0	81.25	< 1	1	0.5	ug/dL	
HGL1-337-(0)-B	HGL1-110	blood	337	4	TM1	0	82.09	< 1	1	0.5	ug/dL	
HGL1-350-(0)-B	HGL1-133	blood	350	4	TM1	0	82.66	< 1	1	0.5	ug/dL	
HGL1-366-(0)-B	HGL1-127	blood	366	4	TM1	0	75.08	< 1	1	0.5	ug/dL	
HGL1-323-(0)-B	HGL1-134	blood	323	5	TM1	0	258.04	< 1	1	0.5	ug/dL	
HGL1-355-(0)-B	HGL1-108	blood	355	5	TM1	0	237.61	< 1	1	0.5	ug/dL	
HGL1-363-(0)-B	HGL1-123	blood	363	5	TM1	0	228.39	< 1	1	0.5	ug/dL	
HGL1-365-(0)-B	HGL1-117	blood	365	5	TM1	0	240.72	< 1	1	0.5	ug/dL	
HGL1-367-(0)-B	HGL1-136	blood	367	5	TM1	0	251.42	< 1	1	0.5	ug/dL	
HGL1-302-(0)-B	HGL1-124	blood	302	6	TM1	0	800.44	< 1	1	0.5	ug/dL	
HGL1-316-(0)-B	HGL1-131	blood	316	6	TM1	0	705.03	< 1	1	0.5	ug/dL	
HGL1-322-(0)-B	HGL1-103	blood	322	6	TM1	0	705.03	< 1	1	0.5	ug/dL	
HGL1-329-(0)-B	HGL1-128	blood	329	6	TM1	0	658.16	< 1	1	0.5	ug/dL	
HGL1-368-(0)-B	HGL1-106	blood	368	6	TM1	0	740.57	< 1	1	0.5	ug/dL	

TABLE A-5

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1-317-(0)-B	HGL1-132	blood	317	7	Control	0	0	<	1	1	0.5	ug/dL
HGL1-336-(0)-B	HGL1-109	blood	336	7	Control	0	0	<	1	1	0.5	ug/dL
HGL1-360-(0)-B	HGL1-125	blood	360	7	Control	0	0	<	1	1	0.5	ug/dL
HGL1-309-(12)-B	HGL1-325	blood	309	1	PbAc	12	57.36	3.1	1	3.1	ug/dL	
HGL1-312-(12)-B	HGL1-313	blood	312	1	PbAc	12	52.49	2	1	2	ug/dL	
HGL1-328-(12)-B	HGL1-312	blood	328	1	PbAc	12	49.44	4.7	1	4.7	ug/dL	
HGL1-346-(12)-B	HGL1-314	blood	346	1	PbAc	12	50.65	2	1	2	ug/dL	
HGL1-354-(12)-B	HGL1-294	blood	354	1	PbAc	12	50.06	5.3	1	5.3	ug/dL	
HGL1-313-(12)-B	HGL1-295	blood	313	2	PbAc	12	157.55	6.5	1	6.5	ug/dL	
HGL1-331-(12)-B	HGL1-298	blood	331	2	PbAc	12	156.85	6.1	1	6.1	ug/dL	
HGL1-349-(12)-B	HGL1-309	blood	349	2	PbAc	12	162.46	6.3	1	6.3	ug/dL	
HGL1-359-(12)-B	HGL1-306	blood	359	2	PbAc	12	148.11	5.4	1	5.4	ug/dL	
HGL1-364-(12)-B	HGL1-302	blood	364	2	PbAc	12	150.96	5.3	1	5.3	ug/dL	
HGL1-333-(12)-B	HGL1-311	blood	333	3	PbAc	12	320.72	8.2	1	8.2	ug/dL	
HGL1-340-(12)-B	HGL1-304	blood	340	3	PbAc	12	308.6	6	1	6	ug/dL	
HGL1-353-(12)-B	HGL1-303	blood	353	3	PbAc	12	317.78	9	1	9	ug/dL	
HGL1-361-(12)-B	HGL1-317	blood	361	3	PbAc	12	322.58	6.6	1	6.6	ug/dL	
HGL1-369-(12)-B	HGL1-299	blood	369	3	PbAc	12	291.74	6.9	1	6.9	ug/dL	
HGL1-304-(12)-B	HGL1-308	blood	304	4	TM1	12	77.86	1	1	1	ug/dL	
HGL1-330-(12)-B	HGL1-324	blood	330	4	TM1	12	80.22	3	1	3	ug/dL	
HGL1-337-(12)-B	HGL1-301	blood	337	4	TM1	12	0	2	1	2	ug/dL	
HGL1-350-(12)-B	HGL1-307	blood	350	4	TM1	12	79.66	3.2	1	3.2	ug/dL	
HGL1-366-(12)-B	HGL1-296	blood	366	4	TM1	12	72.99	2	1	2	ug/dL	
HGL1-323-(12)-B	HGL1-300	blood	323	5	TM1	12	226.22	7.3	1	7.3	ug/dL	
HGL1-355-(12)-B	HGL1-291	blood	355	5	TM1	12	245.91	6	1	6	ug/dL	
HGL1-363-(12)-B	HGL1-297	blood	363	5	TM1	12	222.02	5.3	1	5.3	ug/dL	
HGL1-365-(12)-B	HGL1-319	blood	365	5	TM1	12	227.23	7.5	1	7.5	ug/dL	
HGL1-367-(12)-B	HGL1-293	blood	367	5	TM1	12	256.13	5.4	1	5.4	ug/dL	
HGL1-302-(12)-B	HGL1-328	blood	302	6	TM1	12	509.8	6.5	1	6.5	ug/dL	
HGL1-316-(12)-B	HGL1-315	blood	316	6	TM1	12	457.23	4.8	1	4.8	ug/dL	
HGL1-322-(12)-B	HGL1-292	blood	322	6	TM1	12	442.5	6.1	1	6.1	ug/dL	
HGL1-329-(12)-B	HGL1-316	blood	329	6	TM1	12	445.27	7.5	1	7.5	ug/dL	
HGL1-368-(12)-B	HGL1-326	blood	368	6	TM1	12	488.73	7.6	1	7.6	ug/dL	
HGL1-317-(12)-B	HGL1-310	blood	317	7	Control	12	0	<	1	1	0.5	ug/dL
HGL1-336-(12)-B	HGL1-321	blood	336	7	Control	12	0	<	1	1	0.5	ug/dL
HGL1-360-(12)-B	HGL1-327	blood	360	7	Control	12	0	<	1	1	0.5	ug/dL
HGL1-309-(15)-B	HGL1-347	blood	309	1	PbAc	15	55.41	3	1	3	ug/dL	
HGL1-312-(15)-B	HGL1-333	blood	312	1	PbAc	15	49.39	3.2	1	3.2	ug/dL	
HGL1-328-(15)-B	HGL1-361	blood	328	1	PbAc	15	47.63	5.2	1	5.2	ug/dL	
HGL1-346-(15)-B	HGL1-346	blood	346	1	PbAc	15	48.02	3.5	1	3.5	ug/dL	
HGL1-354-(15)-B	HGL1-360	blood	354	1	PbAc	15	46.59	5	1	5	ug/dL	
HGL1-313-(15)-B	HGL1-357	blood	313	2	PbAc	15	152.1	8.5	1	8.5	ug/dL	
HGL1-331-(15)-B	HGL1-358	blood	331	2	PbAc	15	150.43	7.9	1	7.9	ug/dL	
HGL1-349-(15)-B	HGL1-340	blood	349	2	PbAc	15	151.88	6.9	1	6.9	ug/dL	
HGL1-359-(15)-B	HGL1-353	blood	359	2	PbAc	15	141.89	5.6	1	5.6	ug/dL	
HGL1-364-(15)-B	HGL1-331	blood	364	2	PbAc	15	142.22	7.3	1	7.3	ug/dL	
HGL1-333-(15)-B	HGL1-330	blood	333	3	PbAc	15	313.61	9.1	1	9.1	ug/dL	
HGL1-340-(15)-B	HGL1-332	blood	340	3	PbAc	15	299.71	9.2	1	9.2	ug/dL	
HGL1-353-(15)-B	HGL1-329	blood	353	3	PbAc	15	304.83	9.5	1	9.5	ug/dL	
HGL1-361-(15)-B	HGL1-335	blood	361	3	PbAc	15	320.48	7.1	1	7.1	ug/dL	
HGL1-369-(15)-B	HGL1-338	blood	369	3	PbAc	15	280.15	7.9	1	7.9	ug/dL	
HGL1-304-(15)-B	HGL1-334	blood	304	4	TM1	15	76.49	3	1	3	ug/dL	
HGL1-330-(15)-B	HGL1-365	blood	330	4	TM1	15	78.5	2	1	2	ug/dL	
HGL1-337-(15)-B	HGL1-341	blood	337	4	TM1	15	57.49	3.3	1	3.3	ug/dL	
HGL1-350-(15)-B	HGL1-356	blood	350	4	TM1	15	79.45	3.1	1	3.1	ug/dL	
HGL1-366-(15)-B	HGL1-364	blood	366	4	TM1	15	70.86	2	1	2	ug/dL	
HGL1-323-(15)-B	HGL1-345	blood	323	5	TM1	15	231.71	6.8	1	6.8	ug/dL	
HGL1-355-(15)-B	HGL1-348	blood	355	5	TM1	15	237.98	4.9	1	4.9	ug/dL	
HGL1-363-(15)-B	HGL1-337	blood	363	5	TM1	15	218.01	5.6	1	5.6	ug/dL	
HGL1-365-(15)-B	HGL1-336	blood	365	5	TM1	15	225.3	8	1	8	ug/dL	
HGL1-367-(15)-B	HGL1-355	blood	367	5	TM1	15	245.76	6.7	1	6.7	ug/dL	
HGL1-302-(15)-B	HGL1-366	blood	302	6	TM1	15	523.84	6.5	1	6.5	ug/dL	
HGL1-316-(15)-B	HGL1-354	blood	316	6	TM1	15	464.88	4.8	1	4.8	ug/dL	
HGL1-322-(15)-B	HGL1-342	blood	322	6	TM1	15	462.95	4.9	1	4.9	ug/dL	
HGL1-329-(15)-B	HGL1-363	blood	329	6	TM1	15	441.22	6	1	6	ug/dL	
HGL1-368-(15)-B	HGL1-349	blood	368	6	TM1	15	492.79	6.5	1	6.5	ug/dL	

TABLE A-5

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1-317-(15)-B	HGL1-359	blood	317	7	Control	15	0	< 1	1	1	0.5	ug/dL
HGL1-336-(15)-B	HGL1-362	blood	336	7	Control	15	0	< 1	1	1	0.5	ug/dL
HGL1-360-(15)-B	HGL1-343	blood	360	7	Control	15	0	< 1	1	1	0.5	ug/dL
HGL1-309-(2)-B	HGL1-141	blood	309	1	PbAc	2	55.93	< 1	1	1	0.5	ug/dL
HGL1-312-(2)-B	HGL1-154	blood	312	1	PbAc	2	48.55	< 1	1	1	0.5	ug/dL
HGL1-328-(2)-B	HGL1-152	blood	328	1	PbAc	2	48.35	< 1	1	1	0.5	ug/dL
HGL1-346-(2)-B	HGL1-163	blood	346	1	PbAc	2	49.39	< 1	1	1	0.5	ug/dL
HGL1-354-(2)-B	HGL1-169	blood	354	1	PbAc	2	46.95	1	1	1	1	ug/dL
HGL1-313-(2)-B	HGL1-157	blood	313	2	PbAc	2	160	2	1	2	ug/dL	
HGL1-331-(2)-B	HGL1-160	blood	331	2	PbAc	2	155.56	< 1	1	1	0.5	ug/dL
HGL1-349-(2)-B	HGL1-146	blood	349	2	PbAc	2	155.56	1	1	1	1	ug/dL
HGL1-359-(2)-B	HGL1-171	blood	359	2	PbAc	2	148.02	< 1	1	1	0.5	ug/dL
HGL1-364-(2)-B	HGL1-172	blood	364	2	PbAc	2	144.21	2	1	2	ug/dL	
HGL1-333-(2)-B	HGL1-148	blood	333	3	PbAc	2	319.9	5.1	1	5.1	ug/dL	
HGL1-340-(2)-B	HGL1-173	blood	340	3	PbAc	2	306.64	3	1	3	ug/dL	
HGL1-353-(2)-B	HGL1-176	blood	353	3	PbAc	2	301.09	2	1	2	ug/dL	
HGL1-361-(2)-B	HGL1-153	blood	361	3	PbAc	2	306.64	2	1	2	ug/dL	
HGL1-369-(2)-B	HGL1-144	blood	369	3	PbAc	2	280.76	3.6	1	3.6	ug/dL	
HGL1-304-(2)-B	HGL1-168	blood	304	4	TM1	2	76.78	< 1	1	1	0.5	ug/dL
HGL1-330-(2)-B	HGL1-155	blood	330	4	TM1	2	77.53	< 1	1	1	0.5	ug/dL
HGL1-337-(2)-B	HGL1-149	blood	337	4	TM1	2	76.78	< 1	1	1	0.5	ug/dL
HGL1-350-(2)-B	HGL1-165	blood	350	4	TM1	2	80.69	< 1	1	1	0.5	ug/dL
HGL1-366-(2)-B	HGL1-150	blood	366	4	TM1	2	69.37	< 1	1	1	0.5	ug/dL
HGL1-323-(2)-B	HGL1-166	blood	323	5	TM1	2	240.33	2	1	2	ug/dL	
HGL1-355-(2)-B	HGL1-143	blood	355	5	TM1	2	236.85	3.4	1	3.4	ug/dL	
HGL1-363-(2)-B	HGL1-161	blood	363	5	TM1	2	216.93	< 1	1	1	0.5	ug/dL
HGL1-365-(2)-B	HGL1-145	blood	365	5	TM1	2	230.17	2	1	2	ug/dL	
HGL1-367-(2)-B	HGL1-147	blood	367	5	TM1	2	239.16	1	1	1	1	ug/dL
HGL1-302-(2)-B	HGL1-164	blood	302	6	TM1	2	493.71	2	1	2	ug/dL	
HGL1-316-(2)-B	HGL1-167	blood	316	6	TM1	2	443.91	2	1	2	ug/dL	
HGL1-322-(2)-B	HGL1-158	blood	322	6	TM1	2	451.84	3	1	3	ug/dL	
HGL1-329-(2)-B	HGL1-162	blood	329	6	TM1	2	408.11	< 1	1	1	0.5	ug/dL
HGL1-368-(2)-B	HGL1-142	blood	368	6	TM1	2	462.15	2	1	2	ug/dL	
HGL1-317-(2)-B	HGL1-174	blood	317	7	Control	2	0	< 1	1	1	0.5	ug/dL
HGL1-336-(2)-B	HGL1-139	blood	336	7	Control	2	0	< 1	1	1	0.5	ug/dL
HGL1-360-(2)-B	HGL1-151	blood	360	7	Control	2	0	< 1	1	1	0.5	ug/dL
HGL1-309-(4)-B	HGL1-205	blood	309	1	PbAc	4	60.24	< 1	1	1	0.5	ug/dL
HGL1-312-(4)-B	HGL1-214	blood	312	1	PbAc	4	52.41	< 1	1	1	0.5	ug/dL
HGL1-328-(4)-B	HGL1-207	blood	328	1	PbAc	4	51.33	1	1	1	1	ug/dL
HGL1-346-(4)-B	HGL1-192	blood	346	1	PbAc	4	50.98	< 1	1	1	0.5	ug/dL
HGL1-354-(4)-B	HGL1-201	blood	354	1	PbAc	4	48.85	2	1	2	ug/dL	
HGL1-313-(4)-B	HGL1-191	blood	313	2	PbAc	4	162.43	3.1	1	3.1	ug/dL	
HGL1-331-(4)-B	HGL1-202	blood	331	2	PbAc	4	160.5	2	1	2	ug/dL	
HGL1-349-(4)-B	HGL1-206	blood	349	2	PbAc	4	159.09	2	1	2	ug/dL	
HGL1-359-(4)-B	HGL1-198	blood	359	2	PbAc	4	150.88	< 1	1	1	0.5	ug/dL
HGL1-364-(4)-B	HGL1-180	blood	364	2	PbAc	4	150.46	1	1	1	1	ug/dL
HGL1-333-(4)-B	HGL1-212	blood	333	3	PbAc	4	324.32	2	1	2	ug/dL	
HGL1-340-(4)-B	HGL1-194	blood	340	3	PbAc	4	307.25	7.1	1	7.1	ug/dL	
HGL1-353-(4)-B	HGL1-181	blood	353	3	PbAc	4	313.5	3	1	3	ug/dL	
HGL1-361-(4)-B	HGL1-199	blood	361	3	PbAc	4	318.11	2	1	2	ug/dL	
HGL1-369-(4)-B	HGL1-190	blood	369	3	PbAc	4	286.85	3.2	1	3.2	ug/dL	
HGL1-304-(4)-B	HGL1-187	blood	304	4	TM1	4	77.67	< 1	1	1	0.5	ug/dL
HGL1-330-(4)-B	HGL1-184	blood	330	4	TM1	4	80.34	< 1	1	1	0.5	ug/dL
HGL1-337-(4)-B	HGL1-188	blood	337	4	TM1	4	79.35	< 1	1	1	0.5	ug/dL
HGL1-350-(4)-B	HGL1-182	blood	350	4	TM1	4	82.4	< 1	1	1	0.5	ug/dL
HGL1-366-(4)-B	HGL1-196	blood	366	4	TM1	4	71.81	< 1	1	1	0.5	ug/dL
HGL1-323-(4)-B	HGL1-210	blood	323	5	TM1	4	239.7	2	1	2	ug/dL	
HGL1-355-(4)-B	HGL1-189	blood	355	5	TM1	4	240.8	2	1	2	ug/dL	
HGL1-363-(4)-B	HGL1-213	blood	363	5	TM1	4	221.36	< 1	1	1	0.5	ug/dL
HGL1-365-(4)-B	HGL1-177	blood	365	5	TM1	4	229.49	2	1	2	ug/dL	
HGL1-367-(4)-B	HGL1-208	blood	367	5	TM1	4	243.81	2	1	2	ug/dL	
HGL1-302-(4)-B	HGL1-209	blood	302	6	TM1	4	513.54	3.6	1	3.6	ug/dL	
HGL1-316-(4)-B	HGL1-186	blood	316	6	TM1	4	456.25	2	1	2	ug/dL	
HGL1-322-(4)-B	HGL1-197	blood	322	6	TM1	4	466.53	3	1	3	ug/dL	
HGL1-329-(4)-B	HGL1-203	blood	329	6	TM1	4	426.85	2	1	2	ug/dL	
HGL1-368-(4)-B	HGL1-178	blood	368	6	TM1	4	479.36	2	1	2	ug/dL	

TABLE A-5

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1-317-(4)-B	HGL1-200	blood	317	7	Control	4	0	<	1	1	0.5	ug/dL
HGL1-336-(4)-B	HGL1-179	blood	336	7	Control	4	0	<	1	1	0.5	ug/dL
HGL1-360-(4)-B	HGL1-211	blood	360	7	Control	4	0	<	1	1	0.5	ug/dL
HGL1-309-(7)-B	HGL1-242	blood	309	1	PbAc	7	57.21	2	1	2	ug/dL	
HGL1-312-(7)-B	HGL1-218	blood	312	1	PbAc	7	51.17	2	1	2	ug/dL	
HGL1-328-(7)-B	HGL1-217	blood	328	1	PbAc	7	49.06	1	1	1	ug/dL	
HGL1-346-(7)-B	HGL1-236	blood	346	1	PbAc	7	48.64	2	1	2	ug/dL	
HGL1-354-(7)-B	HGL1-248	blood	354	1	PbAc	7	47.35	3.2	1	3.2	ug/dL	
HGL1-313-(7)-B	HGL1-232	blood	313	2	PbAc	7	155.73	6.1	1	6.1	ug/dL	
HGL1-331-(7)-B	HGL1-251	blood	331	2	PbAc	7	154.68	3.3	1	3.3	ug/dL	
HGL1-349-(7)-B	HGL1-237	blood	349	2	PbAc	7	155.31	4.3	1	4.3	ug/dL	
HGL1-359-(7)-B	HGL1-252	blood	359	2	PbAc	7	144.93	3	1	3	ug/dL	
HGL1-364-(7)-B	HGL1-221	blood	364	2	PbAc	7	146.41	3	1	3	ug/dL	
HGL1-333-(7)-B	HGL1-223	blood	333	3	PbAc	7	318.88	4.1	1	4.1	ug/dL	
HGL1-340-(7)-B	HGL1-238	blood	340	3	PbAc	7	303.12	5.9	1	5.9	ug/dL	
HGL1-353-(7)-B	HGL1-231	blood	353	3	PbAc	7	308.33	6.9	1	6.9	ug/dL	
HGL1-361-(7)-B	HGL1-228	blood	361	3	PbAc	7	318.01	4.8	1	4.8	ug/dL	
HGL1-369-(7)-B	HGL1-219	blood	369	3	PbAc	7	282.89	6.3	1	6.3	ug/dL	
HGL1-304-(7)-B	HGL1-235	blood	304	4	TM1	7	74.46	<	1	1	0.5	ug/dL
HGL1-330-(7)-B	HGL1-245	blood	330	4	TM1	7	77.38	2	1	2	ug/dL	
HGL1-337-(7)-B	HGL1-243	blood	337	4	TM1	7	76.63	1	1	1	ug/dL	
HGL1-350-(7)-B	HGL1-239	blood	350	4	TM1	7	78.26	1	1	1	ug/dL	
HGL1-366-(7)-B	HGL1-234	blood	366	4	TM1	7	69.24	1	1	1	ug/dL	
HGL1-323-(7)-B	HGL1-220	blood	323	5	TM1	7	228.66	4.6	1	4.6	ug/dL	
HGL1-355-(7)-B	HGL1-244	blood	355	5	TM1	7	235.41	<	1	1	0.5	ug/dL
HGL1-363-(7)-B	HGL1-230	blood	363	5	TM1	7	215.69	3	1	3	ug/dL	
HGL1-365-(7)-B	HGL1-240	blood	365	5	TM1	7	220.23	<	1	1	0.5	ug/dL
HGL1-367-(7)-B	HGL1-229	blood	367	5	TM1	7	243.28	3	1	3	ug/dL	
HGL1-302-(7)-B	HGL1-215	blood	302	6	TM1	7	508.67	5.7	1	5.7	ug/dL	
HGL1-316-(7)-B	HGL1-224	blood	316	6	TM1	7	443.26	3.3	1	3.3	ug/dL	
HGL1-322-(7)-B	HGL1-222	blood	322	6	TM1	7	445.48	4.1	1	4.1	ug/dL	
HGL1-329-(7)-B	HGL1-241	blood	329	6	TM1	7	420.68	3.6	1	3.6	ug/dL	
HGL1-368-(7)-B	HGL1-249	blood	368	6	TM1	7	474.67	4.1	1	4.1	ug/dL	
HGL1-317-(7)-B	HGL1-216	blood	317	7	Control	7	0	<	1	1	0.5	ug/dL
HGL1-336-(7)-B	HGL1-250	blood	336	7	Control	7	0	<	1	1	0.5	ug/dL
HGL1-360-(7)-B	HGL1-246	blood	360	7	Control	7	0	<	1	1	0.5	ug/dL
HGL1-309-(9)-B	HGL1-262	blood	309	1	PbAc	9	57.99	2	1	2	ug/dL	
HGL1-312-(9)-B	HGL1-272	blood	312	1	PbAc	9	52.69	2	1	2	ug/dL	
HGL1-328-(9)-B	HGL1-261	blood	328	1	PbAc	9	50.01	3.9	1	3.9	ug/dL	
HGL1-346-(9)-B	HGL1-260	blood	346	1	PbAc	9	50.24	3	1	3	ug/dL	
HGL1-354-(9)-B	HGL1-256	blood	354	1	PbAc	9	49.27	3.1	1	3.1	ug/dL	
HGL1-313-(9)-B	HGL1-257	blood	313	2	PbAc	9	159.34	6.3	1	6.3	ug/dL	
HGL1-331-(9)-B	HGL1-285	blood	331	2	PbAc	9	158.14	7.1	1	7.1	ug/dL	
HGL1-349-(9)-B	HGL1-254	blood	349	2	PbAc	9	161.15	4.7	1	4.7	ug/dL	
HGL1-359-(9)-B	HGL1-289	blood	359	2	PbAc	9	148.35	4.1	1	4.1	ug/dL	
HGL1-364-(9)-B	HGL1-287	blood	364	2	PbAc	9	150.64	5.1	1	5.1	ug/dL	
HGL1-333-(9)-B	HGL1-276	blood	333	3	PbAc	9	324.32	7.8	1	7.8	ug/dL	
HGL1-340-(9)-B	HGL1-280	blood	340	3	PbAc	9	310.43	6.8	1	6.8	ug/dL	
HGL1-353-(9)-B	HGL1-275	blood	353	3	PbAc	9	315.06	7.9	1	7.9	ug/dL	
HGL1-361-(9)-B	HGL1-290	blood	361	3	PbAc	9	324.32	6.9	1	6.9	ug/dL	
HGL1-369-(9)-B	HGL1-266	blood	369	3	PbAc	9	289.85	6.7	1	6.7	ug/dL	
HGL1-304-(9)-B	HGL1-286	blood	304	4	TM1	9	77.79	<	1	1	0.5	ug/dL
HGL1-330-(9)-B	HGL1-273	blood	330	4	TM1	9	80.61	2	1	2	ug/dL	
HGL1-337-(9)-B	HGL1-282	blood	337	4	TM1	9	79.48	1	1	1	ug/dL	
HGL1-350-(9)-B	HGL1-268	blood	350	4	TM1	9	80.51	1	1	1	ug/dL	
HGL1-366-(9)-B	HGL1-283	blood	366	4	TM1	9	72.44	1	1	1	ug/dL	
HGL1-323-(9)-B	HGL1-284	blood	323	5	TM1	9	232.03	5.3	1	5.3	ug/dL	
HGL1-355-(9)-B	HGL1-288	blood	355	5	TM1	9	243.34	5.7	1	5.7	ug/dL	
HGL1-363-(9)-B	HGL1-255	blood	363	5	TM1	9	222.53	3.8	1	3.8	ug/dL	
HGL1-365-(9)-B	HGL1-253	blood	365	5	TM1	9	225.51	5.2	1	5.2	ug/dL	
HGL1-367-(9)-B	HGL1-281	blood	367	5	TM1	9	253.36	3.2	1	3.2	ug/dL	
HGL1-302-(9)-B	HGL1-270	blood	302	6	TM1	9	522.35	3.3	1	3.3	ug/dL	
HGL1-316-(9)-B	HGL1-277	blood	316	6	TM1	9	454.08	3.5	1	3.5	ug/dL	
HGL1-322-(9)-B	HGL1-279	blood	322	6	TM1	9	450.4	6.4	1	6.4	ug/dL	
HGL1-329-(9)-B	HGL1-274	blood	329	6	TM1	9	436.75	6.5	1	6.5	ug/dL	
HGL1-368-(9)-B	HGL1-259	blood	368	6	TM1	9	491.35	5.8	1	5.8	ug/dL	

TABLE A-5

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1-317-(9)-B	HGL1-264	blood	317	7	Control	9	0	< 1	1	1	0.5	ug/dL
HGL1-336-(9)-B	HGL1-278	blood	336	7	Control	9	0	< 1	1	1	0.5	ug/dL
HGL1-360-(9)-B	HGL1-271	blood	360	7	Control	9	0	< 1	1	1	0.5	ug/dL

Actual BW Adj Dose: Values presented are for individual dosing days only; average doses over the course of the study are presented in Table A-3, as well as Table 2-1 in the main text.

Reported Conc: Accounts for all dilutions in sample preparation and analysis.

AdjConc (Adjusted Concentration): Non-detects evaluated at 1/2 the quantitation limit (DL).

TABLE A-6
LEAD ANALYTICAL RESULTS FOR QUALITY ASSURANCE SAMPLES

Analytical Spikes

Sample Number	Matrix	Conc (spiked sample)	Original Conc	Units	Recovery
HGL1-202SPK	blood	11	2	ug/dL	95%
HGL1-109SPK	blood	9.5	<1	ug/dL	95%
HGL1-118SPK	blood	9.4	<1	ug/dL	94%
HGL1-127SPK	blood	9	<1	ug/dL	90%
HGL1-136SPK	blood	9.7	<1	ug/dL	97%
HGL1-148SPK	blood	14	5.1	ug/dL	87%
HGL1-157SPK	blood	12	2	ug/dL	98%
HGL1-193SPK	blood	10	<1	ug/dL	105%
HGL1-363SPK	blood	15	6	ug/dL	89%
HGL1-211SPK	blood	10	<1	ug/dL	100%
HGL1-222SPK	blood	14	4.1	ug/dL	94%
HGL1-336SPK	blood	17	8	ug/dL	90%
HGL1-184SPK	blood	9.7	<1	ug/dL	97%
HGL1-345SPK	blood	16	6.8	ug/dL	94%
HGL1-231SPK	blood	16	6.9	ug/dL	96%
HGL1-327SPK	blood	9.2	<1	ug/dL	92%
HGL1-318SPK	blood	16	7.4	ug/dL	89%
HGL1-309SPK	blood	15	6.3	ug/dL	85%
HGL1-283SPK	blood	11	1	ug/dL	97%
HGL1-274SPK	blood	16	6.5	ug/dL	97%
HGL1-265SPK	blood	9.9	1	ug/dL	86%
HGL1-354SPK	blood	15	4.8	ug/dL	98%
HGL1-473SPK	femur	20	8.6	ug/g	114%
HGL1-464SPK	femur	21	9.8	ug/g	112%
HGL1-455SPK	femur	15	4.5	ug/g	105%
HGL1-446SPK	femur	18	9.2	ug/g	88%
HGL1-374Rspk	liver	0.98	0.59	ug/g	98%
HGL1-396SPK	liver	0.79	0.48	ug/g	78%
HGL1-385SPK	liver	0.74	0.42	ug/g	80%

Analytical Duplicates (Post-Digestion)

Sample Number	Matrix	Conc (duplicate)	Original Conc	Units	Relative Difference
HGL1-168R	blood	<1	<1	ug/dL	NA
HGL1-110R	blood	<1	<1	ug/dL	NA
HGL1-120R	blood	<1	<1	ug/dL	NA
HGL1-130R	blood	<1	<1	ug/dL	NA
HGL1-138R	blood	<1	<1	ug/dL	NA
HGL1-158R	blood	<1	3	ug/dL	NA
HGL1-360R	blood	4.7	5	ug/dL	w/in 1
HGL1-178R	blood	2	2	ug/dL	w/in 1
HGL1-188R	blood	<1	<1	ug/dL	NA
HGL1-198R	blood	<1	<1	ug/dL	NA
HGL1-208R	blood	2	2	ug/dL	w/in 1
HGL1-340R	blood	7.2	6.9	ug/dL	w/in 1
HGL1-148R	blood	4.7	5.1	ug/dL	w/in 1
HGL1-350R	blood	8.6	8.9	ug/dL	w/in 1
HGL1-220R	blood	4.5	4.6	ug/dL	w/in 1
HGL1-330R	blood	9.6	9.1	ug/dL	w/in 1
HGL1-311R	blood	<1	8.2	ug/dL	NA
HGL1-276R	blood	8	7.8	ug/dL	w/in 1
HGL1-266R	blood	6.6	6.7	ug/dL	w/in 1
HGL1-250R	blood	<1	<1	ug/dL	NA
HGL1-240R	blood	<1	<1	ug/dL	NA
HGL1-230R	blood	3	3	ug/dL	w/in 1
HGL1-300R	blood	7.4	7.3	ug/dL	w/in 1
HGL1-466R	femur	14	13	ug/g	7.4%
HGL1-474R	femur	7.9	7.4	ug/g	within 1
HGL1-456R	femur	3	2.5	ug/g	within 1
HGL1-446R	femur	9.4	9.2	ug/g	within 1
HGL1-437R	kidney	0.32	0.3	ug/g	6.5%
HGL1-428R	kidney	0.03	0.03	ug/g	within .01
HGL1-419R	kidney	0.063	0.065	ug/g	within .01
HGL1-410R	kidney	0.064	0.059	ug/g	within .01
HGL1-374R	liver	0.59	0.59	ug/g	within .01
HGL1-394R	liver	0.37	0.4	ug/g	7.8%
HGL1-384R	liver	0.28	0.27	ug/g	within .01

Preparative Spikes

Sample Number	Matrix	Conc (spiked sample)	Original Conc	Units	Recovery
HGL1-373SPK-L	liver	0.23	0.092	ug/g	138%
HGL1-398SPKH-L	liver	0.48	0.08	ug/g	133%
HGL1-400SPKH-L	liver	0.63	0.26	ug/g	123%
HGL1-411-SHi-K	kidney	0.76	0.41	ug/g	117%
HGL1-418SLo-K	kidney	0.14	0.063	ug/g	77%
HGL1-430SMed-K	kidney	0.55	0.36	ug/g	95%

Laboratory Control Standards

QC Std ID	QC Std Conc	Unadjusted Conc	Units	Percent Recovery
NIST 1400	9.07	12	ug/g	132.3%

The DOLT-3 standards that were analyzed with the liver and kidney study samples were not prepared properly and yielded inaccurate results.

TABLE A-6**Sample Preparation Replicates**

Tag Number	Matrix	Pig Number	Original Pig #	Group	Material Administered	Target Dose (ug/kg-d)	Collection Day	Pb Conc	AdjConc	Original AdjConc
HGL1-380	liver	2316	316	6	TM1	450	15	0.38	0.38 ug/g	0.33
HGL1-376	liver	2366	366	4	TM1	75	15	0.064	0.064 ug/g	0.058
HGL1-387	liver	2364	364	2	PbAc	150	15	0.59	0.59 ug/g	0.53
HGL1-431	kidney	2336	336	7	Control	0	15	0.24	0.24 ug/g	0.005
HGL1-412	kidney	2367	367	5	TM1	225	15	0.04	0.04 ug/g	0.2
HGL1-433	kidney	2361	361	3	PbAc	300	15	0.28	0.28 ug/g	0.29
HGL1-440	femur	2367	367	5	TM1	225	15	13	13 ug/g	13
HGL1-468	femur	2361	361	3	PbAc	300	15	17	17 ug/g	15
HGL1-474	femur	2354	354	1	PbAc	50	15	7.4	7.4 ug/g	8.6
HGL1-195	blood	2304	304	4	TM1	75	4	<1	0.5 ug/dL	0.5
HGL1-193	blood	2331	331	2	PbAc	150	4	<1	0.5 ug/dL	2
HGL1-185	blood	2316	316	6	TM1	450	4	2	2 ug/dL	2
HGL1-140	blood	2312	312	1	PbAc	50	2	<1	0.5 ug/dL	0.5
HGL1-159	blood	2323	323	5	TM1	225	2	<1	0.5 ug/dL	2
HGL1-175	blood	2317	317	7	Control	0	2	<1	0.5 ug/dL	0.5
HGL1-227	blood	2333	333	3	PbAc	300	7	3	3 ug/dL	4.1
HGL1-137	blood	2313	313	2	PbAc	150	0	<1	0.5 ug/dL	0.5
HGL1-318	blood	2329	329	6	TM1	450	12	7.4	7.4 ug/dL	7.5
HGL1-114	blood	2302	302	6	TM1	450	0	<1	0.5 ug/dL	0.5
HGL1-226	blood	2355	355	5	TM1	225	7	4.7	4.7 ug/dL	0.5
HGL1-233	blood	2328	328	1	PbAc	50	7	1	1 ug/dL	1
HGL1-258	blood	2322	322	6	TM1	450	9	5.9	5.9 ug/dL	6.4
HGL1-102	blood	2309	309	1	PbAc	50	0	<1	0.5 ug/dL	0.5
HGL1-267	blood	2330	330	4	TM1	75	9	2	2 ug/dL	2
HGL1-323	blood	2349	349	2	PbAc	150	12	6.7	6.7 ug/dL	6.3
HGL1-305	blood	2337	337	4	TM1	75	12	2	2 ug/dL	2
HGL1-350	blood	2340	340	3	PbAc	300	15	8.9	8.9 ug/dL	9.2
HGL1-352	blood	2363	363	5	TM1	225	15	4.8	4.8 ug/dL	5.6
HGL1-344	blood	2346	346	1	PbAc	50	15	3.8	3.8 ug/dL	3.5
HGL1-263	blood	2336	336	7	Control	0	9	<1	0.5 ug/dL	0.5

Blood Lead Check Samples

Tag Number	Matrix	CDC Blood Lead Check Sample	CDC Concentration	Pb Conc	AdjConc
HGL1-351	blood	CDC BLLRS sample 294	1.9 ug/dL	2	2 ug/dL
HGL1-265	blood	CDC BLLRS sample 294	1.9 ug/dL	1	1 ug/dL
HGL1-247	blood	CDC BLLRS sample 294	1.9 ug/dL	2	2 ug/dL
HGL1-170	blood	CDC BLLRS sample 294	1.9 ug/dL	1	1 ug/dL
HGL1-126	blood	CDC BLLRS sample 294	1.9 ug/dL	2	2 ug/dL
HGL1-322	blood	CDC BLLRS sample 199	5.5 ug/dL	3.2	3.2 ug/dL
HGL1-225	blood	CDC BLLRS sample 199	5.5 ug/dL	2	2 ug/dL
HGL1-204	blood	CDC BLLRS sample 199	5.5 ug/dL	<1	0.5 ug/dL
HGL1-107	blood	CDC BLLRS sample 199	5.5 ug/dL	4.5	4.5 ug/dL
HGL1-339	blood	CDC BLLRS sample 592	13.9 ug/dL	13	13 ug/dL
HGL1-320	blood	CDC BLLRS sample 592	13.9 ug/dL	12	12 ug/dL
HGL1-269	blood	CDC BLLRS sample 592	13.9 ug/dL	12	12 ug/dL
HGL1-183	blood	CDC BLLRS sample 592	13.9 ug/dL	12	12 ug/dL
HGL1-156	blood	CDC BLLRS sample 592	13.9 ug/dL	7.9	7.9 ug/dL

AdjConc (Adjusted Concentration): Non-detects evaluated at 1/2 the quantitation limit (DL).

TABLE A-7 IDENTIFICATION OF POTENTIAL BLOOD LEAD OUTLIERS

Material Administered	Group	Pig Number	Target Dose	Actual Dose*	Blood Lead (µg/dL) by Day						
					0	2	4	7	9	12	15
PbAc	1	309	50	55.41	0.5	0.5	0.5	2.0	2.0	3.1	3.0
PbAc	1	312	50	49.39	0.5	0.5	0.5	2.0	2.0	2.0	3.2
PbAc	1	328	50	47.63	0.5	0.5	1.0	1.0	3.9	4.7	5.2
PbAc	1	346	50	48.02	0.5	0.5	0.5	2.0	3.0	2.0	3.5
PbAc	1	354	50	46.59	0.5	1.0	2.0	3.2	3.1	5.3	5.0
PbAc	2	313	150	152.10	0.5	2.0	3.1	6.1	6.3	6.5	8.5
PbAc	2	331	150	150.43	0.5	0.5	2.0	3.3	7.1	6.1	7.9
PbAc	2	349	150	151.88	0.5	1.0	2.0	4.3	4.7	6.3	6.9
PbAc	2	359	150	141.89	0.5	0.5	0.5	3.0	4.1	5.4	5.6
PbAc	2	364	150	142.22	0.5	2.0	1.0	3.0	5.1	5.3	7.3
PbAc	3	333	300	313.61	0.5	5.1	2.0	4.1	7.8	8.2	9.1
PbAc	3	340	300	299.71	0.5	3.0	7.1	5.9	6.8	6.0	9.2
PbAc	3	353	300	304.83	0.5	2.0	3.0	6.9	7.9	9.0	9.5
PbAc	3	361	300	320.48	0.5	2.0	2.0	4.8	6.9	6.6	7.1
PbAc	3	369	300	280.15	0.5	3.6	3.2	6.3	6.7	6.9	7.9
TM1	4	304	75	76.49	0.5	0.5	0.5	0.5	0.5	1.0	3.0
TM1	4	330	75	78.50	0.5	0.5	0.5	2.0	2.0	3.0	2.0
TM1	4	337	75	57.49	0.5	0.5	0.5	1.0	1.0	2.0	3.3
TM1	4	350	75	79.45	0.5	0.5	0.5	1.0	1.0	3.2	3.1
TM1	4	366	75	70.86	0.5	0.5	0.5	1.0	1.0	2.0	2.0
TM1	5	323	225	231.71	0.5	2.0	2.0	4.6	5.3	7.3	6.8
TM1	5	355	225	237.98	0.5	3.4	2.0	0.5	5.7	6.0	4.9
TM1	5	363	225	218.01	0.5	0.5	0.5	3.0	3.8	5.3	5.6
TM1	5	365	225	225.30	0.5	2.0	2.0	0.5	5.2	7.5	8.0
TM1	5	367	225	245.76	0.5	1.0	2.0	3.0	3.2	5.4	6.7
TM1	6	302	450	523.84	0.5	2.0	3.6	5.7	3.3	6.5	6.5
TM1	6	316	450	464.88	0.5	2.0	2.0	3.3	3.5	4.8	4.8
TM1	6	322	450	462.95	0.5	3.0	3.0	4.1	6.4	6.1	4.9
TM1	6	329	450	441.22	0.5	0.5	2.0	3.6	6.5	7.5	6.0
TM1	6	368	450	492.79	0.5	2.0	2.0	4.1	5.8	7.6	6.5
Control	7	317	0	0.00	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Control	7	336	0	0.00	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Control	7	360	0	0.00	0.5	0.5	0.5	0.5	0.5	0.5	0.5

*Average body weight-adjusted dose for each pig over the course of the study (days 0-14).

Dose units: ug/kg-d

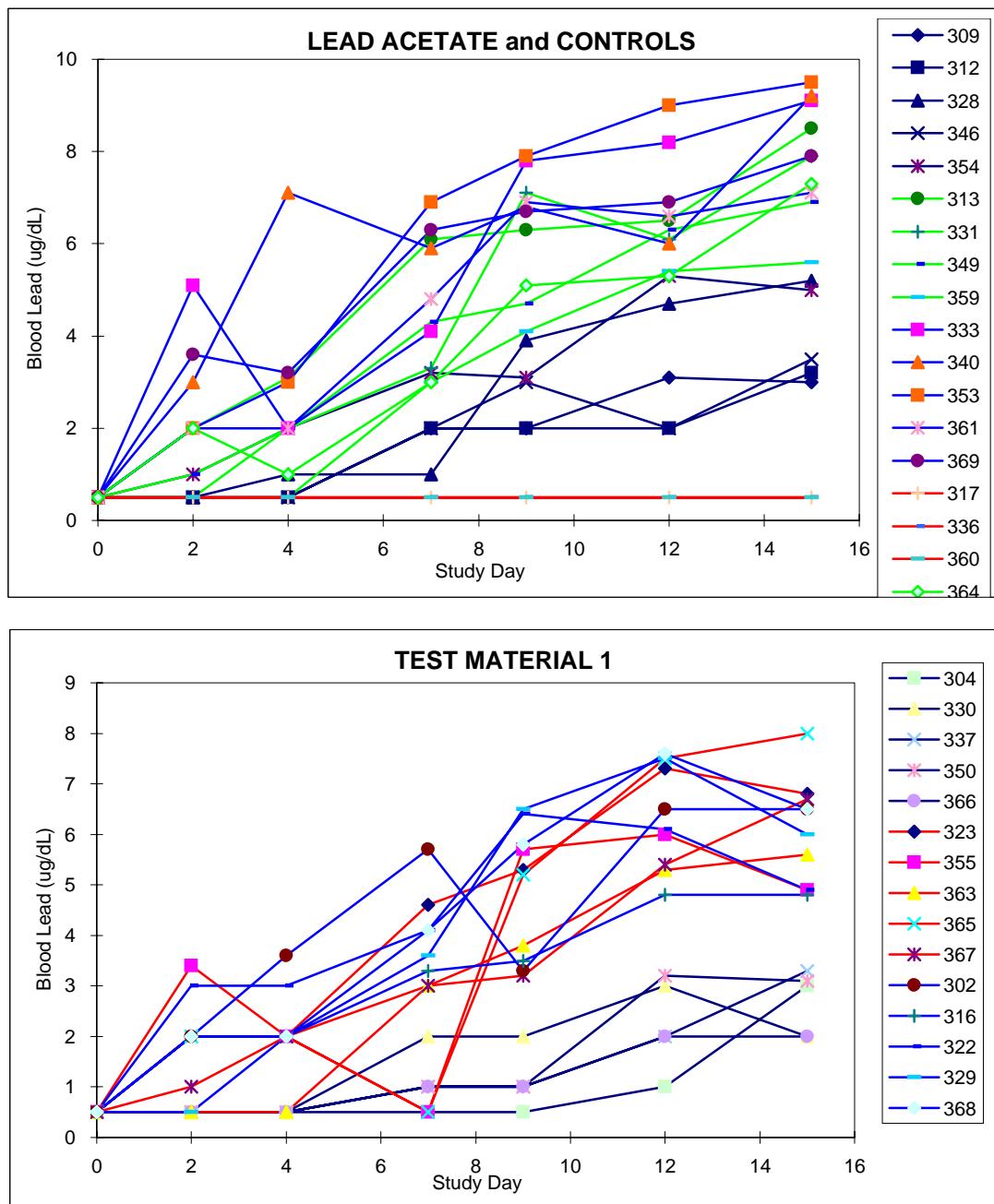
- Data point flagged as potential outlier (group mean < 5 µg/dL)
- Data point flagged as potential outlier (group mean > 5 µg/dL)
- Data point flagged as potential outlier (professional judgment)
- Data point judged to be outlier; excluded from further analyses

TABLE A-8 AREA UNDER CURVE DETERMINATIONS

results.

Group	Pig Number	AUC ($\mu\text{g}/\text{dL}\cdot\text{days}$) for Time Interval Shown						AUC Total ($\mu\text{g}/\text{dL}\cdot\text{days}$)
		0-2	2-4	4-7	7-9	9-12	12-15	
1	309	1.00	1.00	3.75	4.00	7.65	9.15	26.55
1	312	1.00	1.00	3.75	4.00	6.00	7.80	23.55
1	328	1.00	1.50	3.00	4.90	12.90	14.85	38.15
1	346	1.00	1.00	3.75	5.00	7.50	8.25	26.50
1	354	1.50	3.00	7.80	6.30	12.60	15.45	46.65
2	313	2.50	5.10	13.80	12.40	19.20	22.50	75.50
2	331	1.00	2.50	7.95	10.40	19.80	21.00	62.65
2	349	1.50	3.00	9.45	9.00	16.50	19.80	59.25
2	359	1.00	1.00	5.25	7.10	14.25	16.50	45.10
2	364	2.50	3.00	6.00	8.10	15.60	18.90	54.10
3	333	1.75	3.25	9.15	11.90	24.00	25.95	76.00
3	340	3.50	10.10	19.50	12.70	19.20	22.80	87.80
3	353	2.50	5.00	14.85	14.80	25.35	27.75	90.25
3	361	2.50	4.00	10.20	11.70	20.25	20.55	69.20
3	369	4.10	6.80	14.25	13.00	20.40	22.20	80.75
4	304	1.00	1.00	1.50	1.00	2.25	6.00	12.75
4	330	1.00	1.00	3.75	4.00	7.50	7.50	24.75
4	337	1.00	1.00	2.25	2.00	4.50	7.95	18.70
4	350	1.00	1.00	2.25	2.00	6.30	9.45	22.00
4	366	1.00	1.00	2.25	2.00	4.50	6.00	16.75
5	323	2.50	4.00	9.90	9.90	18.90	21.15	66.35
5	355	3.90	5.40	9.33	9.92	17.55	16.35	62.45
5	363	1.00	1.00	5.25	6.80	13.65	16.35	44.05
5	365	2.50	4.00	8.88	9.12	19.05	23.25	66.80
5	367	1.50	3.00	7.50	6.20	12.90	18.15	49.25
6	302	2.50	5.60	13.95	11.72	18.78	19.50	72.05
6	316	2.50	4.00	7.95	6.80	12.45	14.40	48.10
6	322	3.50	6.00	10.65	10.50	18.75	16.50	65.90
6	329	1.00	2.50	8.40	10.10	21.00	20.25	63.25
6	368	2.50	4.00	9.15	9.90	20.10	21.15	66.80
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	317	1.00	1.00	1.50	1.00	1.50	1.50	7.50
7	336	1.00	1.00	1.50	1.00	1.50	1.50	7.50
7	360	1.00	1.00	1.50	1.00	1.50	1.50	7.50

FIGURE A-1 BLOOD LEAD DATA BY DAY



APPENDIX B

DETAILED RESULTS FOR STUDY 2

TABLE B-1 SCHEDULE

Study Day	Day	Date	Bleed	Dose Administration	Feed Special Diet	Weigh	Dose Prep	Cull Pigs/ Assign Dose Group	Sacrifice/ Necropsy
-5	Wednesday	4/19/06			transition	X		Cull Pigs	
-4	Thursday	4/20/06			transition				
-3	Friday	4/21/06			X			Assign Dose Groups	
-2	Saturday	4/22/06			X				
-1	Sunday	4/23/06			X	X	X		
0	Monday	4/24/06	X	X	X				
1	Tuesday	4/25/06		X	X				
2	Wednesday	4/26/06	X	X	X	X	X		
3	Thursday	4/27/06		X	X				
4	Friday	4/28/06	X	X	X				
5	Saturday	4/29/06		X	X	X	X		
6	Sunday	4/30/06		X	X				
7	Monday	5/1/06	X	X	X				
8	Tuesday	5/2/06		X	X	X	X		
9	Wednesday	5/3/06	X	X	X				
10	Thursday	5/4/06		X	X				
11	Friday	5/5/06		X	X	X	X		
12	Saturday	5/6/06	X	X	X				
13	Sunday	5/7/06		X	X				
14	Monday	5/8/06		X	X	X			
15	Tuesday	5/9/06	X						X

TABLE B-2 GROUP ASSIGNMENTS

Pig Number	Dose Group	Material Administered	Target Dose of Lead ($\mu\text{g/kg-day}$)
256			
262	1	Lead Acetate	300
273			
257			
261			
263	2	Test Material 2	75
266			
272			
253			
260			
268	3	Test Material 2	225
271			
274			
254			
258			
259	4	Test Material 2	450
264			
267			
255			
269	5	Control	0
270			

TABLE B-3 BODY WEIGHTS AND ACTUAL ADMINISTERED DOSES, BY DAY

Body weights were measured on days -1, 2, 5, 8, 11, and 14. Weights for other days are estimated, based on linear interpolation between measured values.

Group	Pig #	Day -1		Day 0		Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Day 8		Day 9		Day 10		Day 11		Day 12		Day 13		Day 14		Days 0-14	
		BW (kg)	Pb Dose ($\mu\text{g}/\text{kg}\cdot\text{d}$)																																
1	256	9.9	0.00	9.8	313.31	9.6	317.65	9.5	241.58	9.7	324.70	9.9	317.62	10.2	271.98	10.1	331.68	10.1	333.33	10.0	335.00	10.3	344.59	10.6	334.33	11.0	324.66	11.5	332.08	12.1	316.09	12.7	301.57	316.01	
1	262	9.1	0.00	9.5	323.81	9.8	312.24	10.2	301.48	10.4	303.85	10.6	297.17	10.9	298.66	11.6	289.21	12.0	280.33	12.4	287.47	12.8	278.10	13.2	269.32	13.6	282.31	13.9	274.88	14.3	267.83	290.50			
1	273	8.6	0.00	8.7	351.72	8.8	347.73	8.9	343.82	9.1	346.70	9.3	339.25	9.5	332.11	9.9	339.53	10.2	327.36	10.6	316.04	10.8	329.68	11.0	324.16	11.2	318.83	11.3	337.94	11.5	332.56	11.7	327.35	334.32	
2	257	9.7	0.00	10.0	76.93	10.3	74.81	10.6	72.80	10.9	74.77	11.2	72.55	11.6	70.45	11.9	73.01	12.3	70.83	12.7	68.77	13.1	72.47	13.5	70.32	13.9	68.28	14.3	73.88	14.7	71.70	15.2	69.65	72.08	
2	261	9.0	0.00	9.2	83.48	9.5	81.27	9.7	79.18	10.1	80.70	10.5	77.75	10.9	75.00	11.2	78.03	11.5	75.98	11.8	74.04	12.2	77.31	12.7	74.37	13.2	71.65	13.6	77.59	14.0	75.38	14.4	73.28	77.00	
2	263	8.8	0.00	9.1	84.55	9.4	81.99	9.7	79.59	9.8	83.75	9.9	82.61	10.3	84.74	10.7	81.44	11.1	78.38	11.7	81.18	12.2	77.52	12.8	74.18	13.1	80.66	13.4	76.65	13.8	76.75	80.61			
2	266	9.4	0.00	9.5	80.98	9.6	79.86	9.8	78.77	9.9	81.92	10.1	80.44	10.3	79.00	10.6	82.20	10.9	80.06	11.2	78.03	11.6	81.88	12.0	79.14	12.4	76.58	12.7	83.42	13.0	81.49	13.3	79.64	80.23	
2	272	9.4	0.00	9.5	81.13	9.5	80.56	9.6	80.00	9.9	82.34	10.2	80.00	10.5	77.87	10.8	80.80	11.1	78.50	11.4	76.32	12.0	78.81	12.6	75.06	13.2	71.65	13.5	78.07	13.8	76.28	14.2	74.58	78.13	
3	253	9.8	0.00	10.0	237.88	10.2	232.84	10.5	228.01	10.6	236.20	10.7	233.26	10.9	230.39	11.2	238.51	11.6	230.96	12.0	223.87	12.5	226.91	13.1	216.82	13.7	207.59	14.1	223.83	14.5	217.90	14.9	212.27	226.48	
3	260	9.5	0.00	9.6	247.77	9.7	244.80	9.9	241.90	10.1	246.69	10.4	239.98	10.7	233.62	11.0	243.20	11.3	236.75	11.6	230.63	12.1	235.69	12.5	226.91	13.0	218.77	13.4	234.95	13.8	227.87	14.3	221.21	235.38	
3	265	9.5	0.00	9.5	251.26	9.5	250.38	9.6	249.50	9.8	254.21	10.1	247.09	10.4	240.36	10.6	251.99	10.8	246.95	11.1	242.10	11.4	250.57	11.7	244.12	12.0	237.99	12.2	259.44	12.4	255.24	12.6	251.18	248.83	
3	271	10.0	0.00	10.2	234.37	10.4	229.48	10.6	224.79	10.9	230.04	11.1	224.53	11.4	219.28	11.6	231.62	11.7	228.65	11.9	225.76	12.2	232.80	12.6	226.01	13.0	219.61	13.4	236.12	13.8	229.25	14.2	222.77	227.67	
3	274	9.3	0.00	9.5	249.94	9.8	242.72	10.1	235.92	10.4	239.59	10.8	232.17	11.1	225.20	11.3	236.40	11.5	231.96	11.8	227.68	12.3	230.91	12.9	220.75	13.5	211.45	13.8	228.42	14.2	222.77	14.5	217.40	230.22	
4	254	8.8	0.00	9.0	520.54	9.2	508.32	9.5	496.67	9.8	503.54	10.1	488.51	10.4	474.35	10.6	510.24	10.8	499.23	11.1	488.69	11.4	514.02	11.8	497.35	12.2	507.32	13.1	489.29	13.6	472.50	14.6	496.82		
4	258	9.7	0.00	9.9	476.50	10.1	467.01	10.3	457.90	10.7	459.55	11.1	441.63	11.6	425.06	12.0	448.75	12.5	431.42	13.0	415.38	13.3	440.78	13.7	430.02	14.0	419.79	14.5	444.71	14.9	431.28	15.4	418.63	440.56	
4	259	9.3	0.00	9.4	498.42	9.5	492.33	9.7	486.37	10.0	490.13	10.4	472.83	10.8	456.70	11.1	488.69	11.4	475.77	11.7	463.52	12.0	489.07	12.4	474.59	12.8	460.94	13.2	488.67	13.6	474.24	14.0	460.65	478.19	
4	264	10.0	0.00	10.1	463.94	10.2	229.32	10.4	283.42	10.8	456.70	11.2	440.31	11.6	425.06	11.9	453.15	12.3	439.62	12.7	426.88	13.1	447.49	13.6	431.60	14.1	416.81	14.4	446.77	14.7	438.14	15.0	429.83	415.27	
4	267	9.4	0.00	9.6	491.47	9.7	483.87	9.9	476.50	10.2	482.90	10.5	468.31	10.8	454.58	11.2	482.86	11.6	466.86	12.0	451.88	12.4	473.32	12.9	456.17	13.4	0.00	13.7	0.00	14.1	0.00	14.5	0.00	345.91	
5	255	10.1	0.00	10.4	0.00	10.7	0.00	11.0	0.00	11.3	0.00	11.7	0.00	12.1	0.00	12.4	0.00	12.8	0.00	13.1	0.00	13.7	0.00	14.3	0.00	14.9	0.00	15.6	0.00	16.0	0.00	0.00	0.00		
5	269	10.7	0.00	11.0	0.00	11.3	0.00	11.6	0.00	11.5	0.00	11.4	0.00	11.6	0.00	11.9	0.00	12.2	0.00	12.8	0.00	13.5	0.00	14.2	0.00	14.4	0.00	14.6	0.00	14.9	0.00	0.00	0.00		
5	270	11.0	0.00	11.3	0.00	11.6	0.00	11.9	0.00	12.2	0.00	12.4	0.00	12.7	0.00	13.1	0.00	13.5	0.00	14.5	0.00	15.2	0.00	15.8	0.00	16.2	0.00	16.6	0.00	17.0	0.00	0.00	0.00		

TABLE B-4 ANIMAL HEALTH

Naxcel Treatment for Illness

First Day of Treatment	Treatment Duration	Pig	Group	Indications
Day 1 (4/25/06)	5 days	264	4	Diarrhea, fever, and inappetance
	11 days	256	1	
Day 4 (4/28/06)	3 days	262	1	
Day 7 (5/1/06)	3 days	271	3	
Day 11 (5/5/06)	2 days	254	4	

Animal Deaths

No animals died while on study.

TABLE B-5
LEAD ANALYTICAL RESULTS FOR STUDY SAMPLES

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1a-256-(15)-I	HGL1a-291	liver	256	1	PbAc	15	316.01		0.41	0	0.41	ug/g
HGL1a-262-(15)-I	HGL1a-303	liver	262	1	PbAc	15	290.5		0.48	0	0.48	ug/g
HGL1a-273-(15)-I	HGL1a-292	liver	273	1	PbAc	15	334.32		0.6	0	0.6	ug/g
HGL1a-257-(15)-I	HGL1a-300	liver	257	2	TM2	15	72.08		0.12	0	0.12	ug/g
HGL1a-261-(15)-I	HGL1a-284	liver	261	2	TM2	15	77		0.074	0	0.074	ug/g
HGL1a-263-(15)-I	HGL1a-288	liver	263	2	TM2	15	80.61		0.046	0	0.046	ug/g
HGL1a-266-(15)-I	HGL1a-283	liver	266	2	TM2	15	80.23		0.11	0	0.11	ug/g
HGL1a-272-(15)-I	HGL1a-305	liver	272	2	TM2	15	78.13		0.086	0	0.086	ug/g
HGL1a-253-(15)-I	HGL1a-299	liver	253	3	TM2	15	226.48		0.42	0	0.42	ug/g
HGL1a-260-(15)-I	HGL1a-301	liver	260	3	TM2	15	235.38		0.46	0	0.46	ug/g
HGL1a-268-(15)-I	HGL1a-294	liver	268	3	TM2	15	248.83		0.48	0	0.48	ug/g
HGL1a-271-(15)-I	HGL1a-286	liver	271	3	TM2	15	227.67		0.38	0	0.38	ug/g
HGL1a-274-(15)-I	HGL1a-293	liver	274	3	TM2	15	230.22		0.38	0	0.38	ug/g
HGL1a-254-(15)-I	HGL1a-290	liver	254	4	TM2	15	496.82		0.48	0	0.48	ug/g
HGL1a-258-(15)-I	HGL1a-285	liver	258	4	TM2	15	440.56		0.44	0	0.44	ug/g
HGL1a-259-(15)-I	HGL1a-304	liver	259	4	TM2	15	478.19		0.66	0	0.66	ug/g
HGL1a-264-(15)-I	HGL1a-296	liver	264	4	TM2	15	415.27		1.6	0	1.6	ug/g
HGL1a-267-(15)-I	HGL1a-289	liver	267	4	TM2	15	345.91		0.93	0	0.93	ug/g
HGL1a-255-(15)-I	HGL1a-295	liver	255	5	Control	15	0	<	0.01	0	0.005	ug/g
HGL1a-269-(15)-I	HGL1a-298	liver	269	5	Control	15	0	<	0.01	0	0.005	ug/g
HGL1a-270-(15)-I	HGL1a-297	liver	270	5	Control	15	0	<	0.01	0	0.005	ug/g
HGL1a-256-(15)-I	HGL1a-322	kidney	256	1	PbAc	15	316.01		0.38	0	0.38	ug/g
HGL1a-262-(15)-I	HGL1a-328	kidney	262	1	PbAc	15	290.5		0.44	0	0.44	ug/g
HGL1a-273-(15)-I	HGL1a-323	kidney	273	1	PbAc	15	334.32		0.6	0	0.6	ug/g
HGL1a-257-(15)-I	HGL1a-320	kidney	257	2	TM2	15	72.08		0.11	0	0.11	ug/g
HGL1a-261-(15)-I	HGL1a-326	kidney	261	2	TM2	15	77		0.069	0	0.069	ug/g
HGL1a-263-(15)-I	HGL1a-312	kidney	263	2	TM2	15	80.61		0.062	0	0.062	ug/g
HGL1a-266-(15)-I	HGL1a-315	kidney	266	2	TM2	15	80.23		0.11	0	0.11	ug/g
HGL1a-272-(15)-I	HGL1a-310	kidney	272	2	TM2	15	78.13		0.089	0	0.089	ug/g
HGL1a-253-(15)-I	HGL1a-311	kidney	253	3	TM2	15	226.48		0.29	0	0.29	ug/g
HGL1a-260-(15)-I	HGL1a-309	kidney	260	3	TM2	15	235.38		0.38	0	0.38	ug/g
HGL1a-268-(15)-I	HGL1a-330	kidney	268	3	TM2	15	248.83		0.36	0	0.36	ug/g
HGL1a-271-(15)-I	HGL1a-321	kidney	271	3	TM2	15	227.67		0.23	0	0.23	ug/g
HGL1a-274-(15)-I	HGL1a-316	kidney	274	3	TM2	15	230.22		0.31	0	0.31	ug/g
HGL1a-254-(15)-I	HGL1a-329	kidney	254	4	TM2	15	496.82		0.4	0	0.4	ug/g
HGL1a-258-(15)-I	HGL1a-325	kidney	258	4	TM2	15	440.56		0.34	0	0.34	ug/g
HGL1a-259-(15)-I	HGL1a-324	kidney	259	4	TM2	15	478.19		0.59	0	0.59	ug/g
HGL1a-264-(15)-I	HGL1a-318	kidney	264	4	TM2	15	415.27		0.85	0	0.85	ug/g
HGL1a-267-(15)-I	HGL1a-319	kidney	267	4	TM2	15	345.91		0.86	0	0.86	ug/g
HGL1a-255-(15)-I	HGL1a-314	kidney	255	5	Control	15	0	<	0.01	0	0.005	ug/g
HGL1a-269-(15)-I	HGL1a-307	kidney	269	5	Control	15	0	<	0.01	0	0.005	ug/g
HGL1a-270-(15)-I	HGL1a-308	kidney	270	5	Control	15	0	<	0.01	0	0.005	ug/g
HGL1a-256-(15)-I	HGL1a-334	femur	256	1	PbAc	15	316.01		8.5	0.5	8.5	ug/g
HGL1a-262-(15)-I	HGL1a-331	femur	262	1	PbAc	15	290.5		14	0.5	14	ug/g
HGL1a-273-(15)-I	HGL1a-340	femur	273	1	PbAc	15	334.32		17	0.5	17	ug/g
HGL1a-257-(15)-I	HGL1a-346	femur	257	2	TM2	15	72.08		2.45	0.5	2.45	ug/g
HGL1a-261-(15)-I	HGL1a-352	femur	261	2	TM2	15	77		2.25	0.5	2.25	ug/g
HGL1a-263-(15)-I	HGL1a-349	femur	263	2	TM2	15	80.61		2.3	0.5	2.3	ug/g
HGL1a-266-(15)-I	HGL1a-333	femur	266	2	TM2	15	80.23		2.5	0.5	2.5	ug/g
HGL1a-272-(15)-I	HGL1a-354	femur	272	2	TM2	15	78.13		2	0.5	2	ug/g
HGL1a-253-(15)-I	HGL1a-337	femur	253	3	TM2	15	226.48		6	0.5	6	ug/g
HGL1a-260-(15)-I	HGL1a-350	femur	260	3	TM2	15	235.38		9.5	0.5	9.5	ug/g
HGL1a-268-(15)-I	HGL1a-351	femur	268	3	TM2	15	248.83		10.5	0.5	10.5	ug/g
HGL1a-271-(15)-I	HGL1a-353	femur	271	3	TM2	15	227.67		6	0.5	6	ug/g
HGL1a-274-(15)-I	HGL1a-344	femur	274	3	TM2	15	230.22		7	0.5	7	ug/g
HGL1a-254-(15)-I	HGL1a-347	femur	254	4	TM2	15	496.82		12.5	0.5	12.5	ug/g
HGL1a-258-(15)-I	HGL1a-342	femur	258	4	TM2	15	440.56		10.5	0.5	10.5	ug/g
HGL1a-259-(15)-I	HGL1a-341	femur	259	4	TM2	15	478.19		20	0.5	20	ug/g
HGL1a-264-(15)-I	HGL1a-339	femur	264	4	TM2	15	415.27		19.5	0.5	19.5	ug/g
HGL1a-267-(15)-I	HGL1a-343	femur	267	4	TM2	15	345.91		16	0.5	16	ug/g
HGL1a-255-(15)-I	HGL1a-338	femur	255	5	Control	15	0	<	0.5	0.5	0.25	ug/g
HGL1a-269-(15)-I	HGL1a-348	femur	269	5	Control	15	0	<	0.5	0.5	0.25	ug/g

TABLE B-5

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units	
HGL1a-270-(15)-f	HGL1a-335	femur	270	5	Control	15	0	<	0.5	0.5	0.25	ug/g	
HGL1a-256-(0)-B	HGL1a-118	blood	256	1	PbAc	0	313.31	<	1	1	0.5	ug/dL	
HGL1a-262-(0)-B	HGL1a-101	blood	262	1	PbAc	0	323.81	<	1	1	0.5	ug/dL	
HGL1a-273-(0)-B	HGL1a-115	blood	273	1	PbAc	0	351.72	<	1	1	0.5	ug/dL	
HGL1a-257-(0)-B	HGL1a-122	blood	257	2	TM2	0	76.93	<	1	1	0.5	ug/dL	
HGL1a-261-(0)-B	HGL1a-111	blood	261	2	TM2	0	83.48	<	1	1	0.5	ug/dL	
HGL1a-263-(0)-B	HGL1a-108	blood	263	2	TM2	0	84.55	<	1	1	0.5	ug/dL	
HGL1a-266-(0)-B	HGL1a-120	blood	266	2	TM2	0	80.98	<	1	1	0.5	ug/dL	
HGL1a-272-(0)-B	HGL1a-110	blood	272	2	TM2	0	81.13	<	1	1	0.5	ug/dL	
HGL1a-253-(0)-B	HGL1a-119	blood	253	3	TM2	0	237.88	<	1	1	0.5	ug/dL	
HGL1a-260-(0)-B	HGL1a-117	blood	260	3	TM2	0	247.77	<	1	1	0.5	ug/dL	
HGL1a-268-(0)-B	HGL1a-102	blood	268	3	TM2	0	251.26	<	1	1	0.5	ug/dL	
HGL1a-271-(0)-B	HGL1a-125	blood	271	3	TM2	0	234.37	<	1	1	0.5	ug/dL	
HGL1a-274-(0)-B	HGL1a-105	blood	274	3	TM2	0	249.94	<	1	1	0.5	ug/dL	
HGL1a-254-(0)-B	HGL1a-103	blood	254	4	TM2	0	520.54	<	1	1	0.5	ug/dL	
HGL1a-258-(0)-B	HGL1a-113	blood	258	4	TM2	0	476.5	<	1	1	0.5	ug/dL	
HGL1a-259-(0)-B	HGL1a-107	blood	259	4	TM2	0	498.42	<	1	1	0.5	ug/dL	
HGL1a-264-(0)-B	HGL1a-126	blood	264	4	TM2	0	463.94	<	1	1	0.5	ug/dL	
HGL1a-267-(0)-B	HGL1a-121	blood	267	4	TM2	0	491.47	<	1	1	0.5	ug/dL	
HGL1a-255-(0)-B	HGL1a-104	blood	255	5	Control	0	0	<	1	1	0.5	ug/dL	
HGL1a-269-(0)-B	HGL1a-124	blood	269	5	Control	0	0	<	1	1	0.5	ug/dL	
HGL1a-270-(0)-B	HGL1a-114	blood	270	5	Control	0	0	<	1	1	0.5	ug/dL	
HGL1a-256-(12)-f	HGL1a-255	blood	256	1	PbAc	12	332.08	5.2	1	5.2		ug/dL	
HGL1a-262-(12)-f	HGL1a-256	blood	262	1	PbAc	12	282.31	9.6	1	9.6		ug/dL	
HGL1a-273-(12)-f	HGL1a-236	blood	273	1	PbAc	12	337.94	13	1	13		ug/dL	
HGL1a-257-(12)-f	HGL1a-241	blood	257	2	TM2	12	73.88	3	1	3		ug/dL	
HGL1a-261-(12)-f	HGL1a-234	blood	261	2	TM2	12	77.59	2	1	2		ug/dL	
HGL1a-263-(12)-f	HGL1a-243	blood	263	2	TM2	12	80.66	2	1	2		ug/dL	
HGL1a-266-(12)-f	HGL1a-251	blood	266	2	TM2	12	83.42	3	1	3		ug/dL	
HGL1a-272-(12)-f	HGL1a-254	blood	272	2	TM2	12	78.07	2	1	2		ug/dL	
HGL1a-253-(12)-f	HGL1a-240	blood	253	3	TM2	12	223.83	7	1	7		ug/dL	
HGL1a-260-(12)-f	HGL1a-246	blood	260	3	TM2	12	234.95	7.6	1	7.6		ug/dL	
HGL1a-268-(12)-f	HGL1a-239	blood	268	3	TM2	12	259.44	6.2	1	6.2		ug/dL	
HGL1a-271-(12)-f	HGL1a-244	blood	271	3	TM2	12	236.12	7.1	1	7.1		ug/dL	
HGL1a-274-(12)-f	HGL1a-248	blood	274	3	TM2	12	228.42	7.9	1	7.9		ug/dL	
HGL1a-254-(12)-f	HGL1a-238	blood	254	4	TM2	12	507.32	7.4	1	7.4		ug/dL	
HGL1a-258-(12)-f	HGL1a-233	blood	258	4	TM2	12	444.71	7.8	1	7.8		ug/dL	
HGL1a-259-(12)-f	HGL1a-252	blood	259	4	TM2	12	488.67	11	1	11		ug/dL	
HGL1a-264-(12)-f	HGL1a-249	blood	264	4	TM2	12	446.77	12	1	12		ug/dL	
HGL1a-267-(12)-f	HGL1a-250	blood	267	4	TM2	12	0	7.7	1	7.7		ug/dL	
HGL1a-255-(12)-f	HGL1a-231	blood	255	5	Control	12	0	<	1	1	0.5		ug/dL
HGL1a-269-(12)-f	HGL1a-242	blood	269	5	Control	12	0	<	1	1	0.5		ug/dL
HGL1a-270-(12)-f	HGL1a-247	blood	270	5	Control	12	0	<	1	1	0.5		ug/dL
HGL1a-256-(15)-f	HGL1a-275	blood	256	1	PbAc	15	316.01	8.5	1	8.5		ug/dL	
HGL1a-262-(15)-f	HGL1a-274	blood	262	1	PbAc	15	290.5	8.5	1	8.5		ug/dL	
HGL1a-273-(15)-f	HGL1a-261	blood	273	1	PbAc	15	334.32	12	1	12		ug/dL	
HGL1a-257-(15)-f	HGL1a-266	blood	257	2	TM2	15	72.08	3.2	1	3.2		ug/dL	
HGL1a-261-(15)-f	HGL1a-273	blood	261	2	TM2	15	77	2	1	2		ug/dL	
HGL1a-263-(15)-f	HGL1a-262	blood	263	2	TM2	15	80.61	2	1	2		ug/dL	
HGL1a-266-(15)-f	HGL1a-282	blood	266	2	TM2	15	80.23	<	1	1	0.5		ug/dL
HGL1a-272-(15)-f	HGL1a-257	blood	272	2	TM2	15	78.13	3	1	3		ug/dL	
HGL1a-253-(15)-f	HGL1a-272	blood	253	3	TM2	15	226.48	6.5	1	6.5		ug/dL	
HGL1a-260-(15)-f	HGL1a-263	blood	260	3	TM2	15	235.38	6.4	1	6.4		ug/dL	
HGL1a-268-(15)-f	HGL1a-279	blood	268	3	TM2	15	248.83	7.9	1	7.9		ug/dL	
HGL1a-271-(15)-f	HGL1a-278	blood	271	3	TM2	15	227.67	7.5	1	7.5		ug/dL	
HGL1a-274-(15)-f	HGL1a-269	blood	274	3	TM2	15	230.22	6	1	6		ug/dL	
HGL1a-254-(15)-f	HGL1a-281	blood	254	4	TM2	15	496.82	7.6	1	7.6		ug/dL	
HGL1a-258-(15)-f	HGL1a-258	blood	258	4	TM2	15	440.56	9.1	1	9.1		ug/dL	
HGL1a-259-(15)-f	HGL1a-276	blood	259	4	TM2	15	478.19	11	1	11		ug/dL	
HGL1a-264-(15)-f	HGL1a-259	blood	264	4	TM2	15	415.27	11	1	11		ug/dL	
HGL1a-267-(15)-f	HGL1a-280	blood	267	4	TM2	15	345.91	10	1	10		ug/dL	
HGL1a-255-(15)-f	HGL1a-267	blood	255	5	Control	15	0	<	1	1	0.5		ug/dL
HGL1a-269-(15)-f	HGL1a-271	blood	269	5	Control	15	0	<	1	1	0.5		ug/dL
HGL1a-270-(15)-f	HGL1a-270	blood	270	5	Control	15	0	<	1	1	0.5		ug/dL

TABLE B-5

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1a-256-(2)-B	HGL1a-149	blood	256	1	PbAc	2	241.58		3.3	1	3.3	ug/dL
HGL1a-262-(2)-B	HGL1a-142	blood	262	1	PbAc	2	301.48		5.9	1	5.9	ug/dL
HGL1a-273-(2)-B	HGL1a-148	blood	273	1	PbAc	2	343.82		7.8	1	7.8	ug/dL
HGL1a-257-(2)-B	HGL1a-127	blood	257	2	TM2	2	72.8	<	1	1	0.5	ug/dL
HGL1a-261-(2)-B	HGL1a-144	blood	261	2	TM2	2	79.18		1	1	1	ug/dL
HGL1a-263-(2)-B	HGL1a-146	blood	263	2	TM2	2	79.59		1	1	1	ug/dL
HGL1a-266-(2)-B	HGL1a-147	blood	266	2	TM2	2	78.77		1	1	1	ug/dL
HGL1a-272-(2)-B	HGL1a-137	blood	272	2	TM2	2	80		2	1	2	ug/dL
HGL1a-253-(2)-B	HGL1a-152	blood	253	3	TM2	2	228.01		3.4	1	3.4	ug/dL
HGL1a-260-(2)-B	HGL1a-151	blood	260	3	TM2	2	241.9		4	1	4	ug/dL
HGL1a-268-(2)-B	HGL1a-135	blood	268	3	TM2	2	249.5		4.6	1	4.6	ug/dL
HGL1a-271-(2)-B	HGL1a-128	blood	271	3	TM2	2	224.79		3.5	1	3.5	ug/dL
HGL1a-274-(2)-B	HGL1a-140	blood	274	3	TM2	2	235.92		4.4	1	4.4	ug/dL
HGL1a-254-(2)-B	HGL1a-133	blood	254	4	TM2	2	496.67		4.3	1	4.3	ug/dL
HGL1a-258-(2)-B	HGL1a-134	blood	258	4	TM2	2	457.9		3	1	3	ug/dL
HGL1a-259-(2)-B	HGL1a-141	blood	259	4	TM2	2	486.37		7.1	1	7.1	ug/dL
HGL1a-264-(2)-B	HGL1a-150	blood	264	4	TM2	2	283.42		3.3	1	3.3	ug/dL
HGL1a-267-(2)-B	HGL1a-131	blood	267	4	TM2	2	476.5		6.6	1	6.6	ug/dL
HGL1a-255-(2)-B	HGL1a-130	blood	255	5	Control	2	0	<	1	1	0.5	ug/dL
HGL1a-269-(2)-B	HGL1a-143	blood	269	5	Control	2	0	<	1	1	0.5	ug/dL
HGL1a-270-(2)-B	HGL1a-129	blood	270	5	Control	2	0	<	1	1	0.5	ug/dL
HGL1a-256-(4)-B	HGL1a-172	blood	256	1	PbAc	4	317.62		5.5	1	5.5	ug/dL
HGL1a-262-(4)-B	HGL1a-178	blood	262	1	PbAc	4	297.17		5.3	1	5.3	ug/dL
HGL1a-273-(4)-B	HGL1a-174	blood	273	1	PbAc	4	339.25		6.3	1	6.3	ug/dL
HGL1a-257-(4)-B	HGL1a-161	blood	257	2	TM2	4	72.55	<	1	1	0.5	ug/dL
HGL1a-261-(4)-B	HGL1a-168	blood	261	2	TM2	4	77.75	<	1	1	0.5	ug/dL
HGL1a-263-(4)-B	HGL1a-156	blood	263	2	TM2	4	83.18		1	1	1	ug/dL
HGL1a-266-(4)-B	HGL1a-175	blood	266	2	TM2	4	80.44		1	1	1	ug/dL
HGL1a-272-(4)-B	HGL1a-162	blood	272	2	TM2	4	80.04		2	1	2	ug/dL
HGL1a-253-(4)-B	HGL1a-171	blood	253	3	TM2	4	233.26		3.3	1	3.3	ug/dL
HGL1a-260-(4)-B	HGL1a-177	blood	260	3	TM2	4	239.98		6	1	6	ug/dL
HGL1a-268-(4)-B	HGL1a-154	blood	268	3	TM2	4	247.09		4.5	1	4.5	ug/dL
HGL1a-271-(4)-B	HGL1a-166	blood	271	3	TM2	4	224.53		3.8	1	3.8	ug/dL
HGL1a-274-(4)-B	HGL1a-167	blood	274	3	TM2	4	232.17		5.1	1	5.1	ug/dL
HGL1a-254-(4)-B	HGL1a-169	blood	254	4	TM2	4	488.51		4.8	1	4.8	ug/dL
HGL1a-258-(4)-B	HGL1a-155	blood	258	4	TM2	4	441.63		4.8	1	4.8	ug/dL
HGL1a-259-(4)-B	HGL1a-153	blood	259	4	TM2	4	472.83		7.8	1	7.8	ug/dL
HGL1a-264-(4)-B	HGL1a-173	blood	264	4	TM2	4	440.31		5.6	1	5.6	ug/dL
HGL1a-267-(4)-B	HGL1a-158	blood	267	4	TM2	4	468.31		6.7	1	6.7	ug/dL
HGL1a-255-(4)-B	HGL1a-170	blood	255	5	Control	4	0	<	1	1	0.5	ug/dL
HGL1a-269-(4)-B	HGL1a-157	blood	269	5	Control	4	0	<	1	1	0.5	ug/dL
HGL1a-270-(4)-B	HGL1a-160	blood	270	5	Control	4	0	<	1	1	0.5	ug/dL
HGL1a-256-(7)-B	HGL1a-199	blood	256	1	PbAc	7	333.33		5.3	1	5.3	ug/dL
HGL1a-262-(7)-B	HGL1a-188	blood	262	1	PbAc	7	289.21		8.7	1	8.7	ug/dL
HGL1a-273-(7)-B	HGL1a-185	blood	273	1	PbAc	7	327.36		6.9	1	6.9	ug/dL
HGL1a-257-(7)-B	HGL1a-179	blood	257	2	TM2	7	70.83	<	1	1	0.5	ug/dL
HGL1a-261-(7)-B	HGL1a-189	blood	261	2	TM2	7	75.98		1	1	1	ug/dL
HGL1a-263-(7)-B	HGL1a-182	blood	263	2	TM2	7	81.44		1	1	1	ug/dL
HGL1a-266-(7)-B	HGL1a-193	blood	266	2	TM2	7	80.06		3	1	3	ug/dL
HGL1a-272-(7)-B	HGL1a-192	blood	272	2	TM2	7	78.5		2	1	2	ug/dL
HGL1a-253-(7)-B	HGL1a-203	blood	253	3	TM2	7	230.96		6.6	1	6.6	ug/dL
HGL1a-260-(7)-B	HGL1a-201	blood	260	3	TM2	7	236.75		6	1	6	ug/dL
HGL1a-268-(7)-B	HGL1a-190	blood	268	3	TM2	7	246.95		5.6	1	5.6	ug/dL
HGL1a-271-(7)-B	HGL1a-180	blood	271	3	TM2	7	228.65		5.2	1	5.2	ug/dL
HGL1a-274-(7)-B	HGL1a-183	blood	274	3	TM2	7	231.96		6.4	1	6.4	ug/dL
HGL1a-254-(7)-B	HGL1a-204	blood	254	4	TM2	7	499.23		5.5	1	5.5	ug/dL
HGL1a-258-(7)-B	HGL1a-181	blood	258	4	TM2	7	431.42		6.4	1	6.4	ug/dL
HGL1a-259-(7)-B	HGL1a-187	blood	259	4	TM2	7	475.77		11	1	11	ug/dL
HGL1a-264-(7)-B	HGL1a-195	blood	264	4	TM2	7	439.62		8.3	1	8.3	ug/dL
HGL1a-267-(7)-B	HGL1a-191	blood	267	4	TM2	7	466.86		5.5	1	5.5	ug/dL
HGL1a-255-(7)-B	HGL1a-197	blood	255	5	Control	7	0	<	1	1	0.5	ug/dL
HGL1a-269-(7)-B	HGL1a-186	blood	269	5	Control	7	0	<	1	1	0.5	ug/dL
HGL1a-270-(7)-B	HGL1a-184	blood	270	5	Control	7	0	<	1	1	0.5	ug/dL
HGL1a-256-(9)-B	HGL1a-227	blood	256	1	PbAc	9	344.59		5.9	1	5.9	ug/dL

TABLE B-5

Sample Number	Tag Number	Matrix	Pig Number	Group	Material Administered	Day	Actual Pb BWAdj Dose (ug/kg-d)	Q	Reported Conc (ug/g)	DL	AdjConc (ug/g)	Units
HGL1a-262-(9)-B	HGL1a-221	blood	262	1	PbAc	9	287.47		6.9	1	6.9	ug/dL
HGL1a-273-(9)-B	HGL1a-219	blood	273	1	PbAc	9	329.68		7.6	1	7.6	ug/dL
HGL1a-257-(9)-B	HGL1a-216	blood	257	2	TM2	9	72.47	<	1	1	0.5	ug/dL
HGL1a-261-(9)-B	HGL1a-206	blood	261	2	TM2	9	77.31		2	1	2	ug/dL
HGL1a-263-(9)-B	HGL1a-229	blood	263	2	TM2	9	81.18		2	1	2	ug/dL
HGL1a-266-(9)-B	HGL1a-207	blood	266	2	TM2	9	81.88		2	1	2	ug/dL
HGL1a-272-(9)-B	HGL1a-223	blood	272	2	TM2	9	78.81		2	1	2	ug/dL
HGL1a-253-(9)-B	HGL1a-213	blood	253	3	TM2	9	226.91		5.5	1	5.5	ug/dL
HGL1a-260-(9)-B	HGL1a-230	blood	260	3	TM2	9	235.69		5.5	1	5.5	ug/dL
HGL1a-268-(9)-B	HGL1a-218	blood	268	3	TM2	9	250.57		4.2	1	4.2	ug/dL
HGL1a-271-(9)-B	HGL1a-224	blood	271	3	TM2	9	232.8		5.9	1	5.9	ug/dL
HGL1a-274-(9)-B	HGL1a-228	blood	274	3	TM2	9	230.91		6.6	1	6.6	ug/dL
HGL1a-254-(9)-B	HGL1a-205	blood	254	4	TM2	9	514.02		6	1	6	ug/dL
HGL1a-258-(9)-B	HGL1a-217	blood	258	4	TM2	9	440.78		7.2	1	7.2	ug/dL
HGL1a-259-(9)-B	HGL1a-215	blood	259	4	TM2	9	489.07		11	1	11	ug/dL
HGL1a-264-(9)-B	HGL1a-208	blood	264	4	TM2	9	447.49		8.7	1	8.7	ug/dL
HGL1a-267-(9)-B	HGL1a-225	blood	267	4	TM2	9	473.32		7.2	1	7.2	ug/dL
HGL1a-255-(9)-B	HGL1a-222	blood	255	5	Control	9	0	<	1	1	0.5	ug/dL
HGL1a-269-(9)-B	HGL1a-226	blood	269	5	Control	9	0	<	1	1	0.5	ug/dL
HGL1a-270-(9)-B	HGL1a-214	blood	270	5	Control	9	0	<	1	1	0.5	ug/dL

Actual BW Adj Dose: Values presented are for individual dosing days only; average doses over the course of the study are presented in Table A-3, as well as Table 2-1 in the main text.

Reported Conc: Accounts for all dilutions in sample preparation and analysis.

AdjConc (Adjusted Concentration): Non-detects evaluated at 1/2 the quantitation limit (DL).

TABLE B-6
LEAD ANALYTICAL RESULTS FOR QUALITY ASSURANCE SAMPLES

Analytical Spikes

Sample Number	Matrix	Conc (spiked sample) ug/L	Original Conc (ug/L)	Percent Recovery
108spk	blood	24	0	96%
117spk	blood	23	0	92%
126spk	blood	22	0	88%
135spk	blood	28	4.6	94%
144spk	blood	22	1	84%
153spk	blood	30	7.8	89%
162spk	blood	22	2	80%
176spk	blood	29	4.5	98%
185spk	blood	30	6.9	92%
194spk	blood	27	2	100%
203spk	blood	29	6.6	90%
212spk	blood	21	0	84%
221spk	blood	29	6.9	88%
230Rspk	blood	29	5.1	96%
240spk	blood	29	7	88%
249spk	blood	34	12	88%
258spk	blood	31	9.1	88%
267spk	blood	23	0	92%
276spk	blood	33	11	88%
283 S M	liver	57	11	115%
301 S H	liver	134	46	110%
285spk	liver	78	44	85%
300spk	liver	46	12	85%
305spk	liver	45	8.6	91%
325 S H	kidney	72	34	95%
309 S Lspk	kidney	81	45	90%
315spk	kidney	49	11	95%
HGL1a-336spk	femur	54	29	104%
HGL1a-344spk	femur	39	14	101%
HGL1a-352spk	femur	31	4.5	106%
HGL1a-354+40	femur	43	4	97%

Analytical Duplicates (Post-Digestion)

Sample Number	Matrix	Conc (duplicate) ug/L	Original Conc (ug/L)	Relatvie Difference
104R	blood	<DL	<DL	NA
114R	blood	<DL	<DL	NA
122R	blood	<DL	<DL	NA
130R	blood	<DL	<DL	NA
139R	blood	6	6.4	6.5%
149R	blood	3.7	3.3	11.4%
157R	blood	<DL	<DL	NA
167R	blood	4.9	5.1	4.0%
170R	blood	<DL	<DL	NA
180R	blood	5.5	5.2	5.6%
190R	blood	5.2	5.6	7.4%
200R	blood	11	12	8.7%
210R	blood	9.2	9.2	0.0%
220R	blood	14	14	0.0%
230R	blood	5.1	5.5	7.5%
240R	blood	7.4	7	5.6%
250R	blood	7.3	7.7	5.3%
260R	blood	14	12	15.4%
270R	blood	<DL	<DL	NA
280R	blood	11	10	9.5%
284R	liver	7	7.4	within 1
294R	liver	48	48	0.0%
304R	liver	67	66	1.5%
323R	kidney	60	60	0.0%
308R	kidney	<DL	<DL	
314R	kidney	<DL	<DL	
HGL1a-331R	femur	28	28	0.0%
HGL1a-340R	femur	35	34	2.9%
HGL1a-351R	femur	21	21	0.0%

Laboratory Control Standards

QC Std ID	QC Std Conc	Unadjusted Concentration	Percent Recovery
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	30 ug/L	107.6%
NIST 1640	27.89 ± 0.14	31 ug/L	111.2%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	30 ug/L	107.6%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	27 ug/L	96.8%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	28 ug/L	100.4%
NIST 1640	27.89 ± 0.14	30 ug/L	107.6%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	27 ug/L	96.8%
NIST 1640	27.89 ± 0.14	29 ug/L	104.0%
NIST 1640	27.89 ± 0.14	30 ug/L	107.6%
NIST 1640	27.89 ± 0.14	31 ug/L	111.2%
NIST 1640	27.89 ± 0.14	30 ug/L	107.6%
NIST 1640	27.89 ± 0.14	30 ug/L	107.6%
NIST 1640	27.89 ± 0.14	30 ug/L	107.6%
Dolt-3	0.319± 0.045	0.35 ug/g	109.8%
Dolt-3	0.319± 0.045	0.35 ug/g	110.5%
Tort-2	0.35± 0.13	0.37 ug/g	105.0%
Tort-2	0.35± 0.13	0.33 ug/g	95.7%
NIST Bone Ash	9.07	7.5 ug/g	82.7%

TABLE B-6**Sample Preparation Replicates**

Tag Number	Matrix	Pig Number	Original Pig #	Group	Material Administered	Target Dose (ug/kg-d)	Collection Day	Pb Conc	AdjConc	Original AdjConc
HGL1a-306	liver	2258	258	4	TM2	450	15	0.46	0.46 ug/g	0.44
HGL1a-287	liver	2256	256	1	PbAc	300	15	0.42	0.42 ug/g	0.41
HGL1a-302	liver	2253	253	3	TM2	225	15	0.4	0.4 ug/g	0.42
HGL1a-327	kidney	2259	259	4	TM2	450	15	0.61	0.61 ug/g	0.59
HGL1a-317	kidney	2257	257	2	TM2	75	15	0.12	0.12 ug/g	0.11
HGL1a-313	kidney	2270	270	5	Control	0	15	<0.01	0.005 ug/g	0.005
HGL1a-332	femur	2261	261	2	TM2	75	15	2.25	2.25 ug/g	2.25
HGL1a-336	femur	2262	262	1	PbAc	300	15	14.5	14.5 ug/g	14
HGL1a-345	femur	2260	260	3	TM2	225	15	10	10 ug/g	9.5
HGL1a-212	blood	2269	269	5	Control	0	9	<1	0.5 ug/dL	0.5
HGL1a-200	blood	2259	259	4	TM2	450	7	12	12 ug/dL	11
HGL1a-202	blood	2266	266	2	TM2	75	7	2	2 ug/dL	3
HGL1a-198	blood	2262	262	1	PbAc	300	7	8.8	8.8 ug/dL	8.7
HGL1a-176	blood	2258	258	4	TM2	450	4	4.5	4.5 ug/dL	4.8
HGL1a-163	blood	2260	260	3	TM2	225	4	5.6	5.6 ug/dL	6
HGL1a-132	blood	2261	261	2	TM2	75	2	1	1 ug/dL	1
HGL1a-139	blood	2254	254	4	TM2	450	2	6.4	6.4 ug/dL	4.3
HGL1a-260	blood	2273	273	1	PbAc	300	15	12	12 ug/dL	12
HGL1a-165	blood	2263	263	2	TM2	75	4	<1	0.5 ug/dL	1
HGL1a-209	blood	2268	268	3	TM2	225	9	4.4	4.4 ug/dL	4.2
HGL1a-210	blood	2264	264	4	TM2	450	9	9.2	9.2 ug/dL	8.7
HGL1a-245	blood	2272	272	2	TM2	75	12	3	3 ug/dL	2
HGL1a-136	blood	2255	255	5	Control	0	2	<1	0.5 ug/dL	0.5
HGL1a-232	blood	2267	267	4	TM2	450	12	7.4	7.4 ug/dL	7.7
HGL1a-109	blood	2253	253	3	TM2	225	0	<1	0.5 ug/dL	0.5
HGL1a-277	blood	2274	274	3	TM2	225	15	7.3	7.3 ug/dL	6
HGL1a-264	blood	2254	254	4	TM2	450	15	8	8 ug/dL	7.6
HGL1a-116	blood	2256	256	1	PbAc	300	0	<1	0.5 ug/dL	0.5
HGL1a-123	blood	2257	257	2	TM2	75	0	<1	0.5 ug/dL	0.5
HGL1a-237	blood	2271	271	3	TM2	225	12	7	7 ug/dL	7.1

Blood Lead Check Samples

Tag Number	Matrix	CDC Blood Lead Check Sample	CDC Concentration	Pb Conc	AdjConc
HGL1a-106	blood	CDC BLLRS sample 294	1.9 ug/dL	2	2 ug/dL
HGL1a-268	blood	CDC BLLRS sample 294	1.9 ug/dL	1	1 ug/dL
HGL1a-211	blood	CDC BLLRS sample 294	1.9 ug/dL	<1	0.5 ug/dL
HGL1a-194	blood	CDC BLLRS sample 294	1.9 ug/dL	2	2 ug/dL
HGL1a-138	blood	CDC BLLRS sample 294	1.9 ug/dL	2	2 ug/dL
HGL1a-112	blood	CDC BLLRS sample 199	5.5 ug/dL	4.6	4.6 ug/dL
HGL1a-235	blood	CDC BLLRS sample 199	5.5 ug/dL	4.6	4.6 ug/dL
HGL1a-196	blood	CDC BLLRS sample 199	5.5 ug/dL	5	5 ug/dL
HGL1a-159	blood	CDC BLLRS sample 199	5.5 ug/dL	5.2	5.2 ug/dL
HGL1a-265	blood	CDC BLLRS sample 592	13.9 ug/dL	13	13 ug/dL
HGL1a-253	blood	CDC BLLRS sample 592	13.9 ug/dL	14	14 ug/dL
HGL1a-220	blood	CDC BLLRS sample 592	13.9 ug/dL	14	14 ug/dL
HGL1a-164	blood	CDC BLLRS sample 592	13.9 ug/dL	14	14 ug/dL
HGL1a-145	blood	CDC BLLRS sample 592	13.9 ug/dL	15	15 ug/dL

AdjConc (Adjusted Concentration): Non-detects evaluated at 1/2 the quantitation limit (DL).

TABLE B-7 IDENTIFICATION OF POTENTIAL BLOOD LEAD OUTLIERS

Material Administered	Group	Pig Number	Target Dose	Actual Dose*	Blood Lead ($\mu\text{g}/\text{dL}$) by Day						
					0	2	4	7	9	12	15
PbAc	1	256	300	316.01	0.5	3.3	5.5	5.3	5.9	5.2	8.5
PbAc	1	262	300	290.50	0.5	5.9	5.3	8.7	6.9	9.6	8.5
PbAc	1	273	300	334.32	0.5	7.8	6.3	6.9	7.6	13.0	12.0
TM2	2	257	75	72.08	0.5	0.5	0.5	0.5	0.5	3.0	3.2
TM2	2	261	75	77.00	0.5	1.0	0.5	1.0	2.0	2.0	2.0
TM2	2	263	75	80.61	0.5	1.0	1.0	1.0	2.0	2.0	2.0
TM2	2	266	75	80.23	0.5	1.0	1.0	3.0	2.0	3.0	0.5
TM2	2	272	75	78.13	0.5	2.0	2.0	2.0	2.0	2.0	3.0
TM2	3	253	225	226.48	0.5	3.4	3.3	6.6	5.5	7.0	6.5
TM2	3	260	225	235.38	0.5	4.0	6.0	6.0	5.5	7.6	6.4
TM2	3	268	225	248.83	0.5	4.6	4.5	5.6	4.2	6.2	7.9
TM2	3	271	225	227.67	0.5	3.5	3.8	5.2	5.9	7.1	7.5
TM2	3	274	225	230.22	0.5	4.4	5.1	6.4	6.6	7.9	6.0
TM2	4	254	450	496.82	0.5	4.3	4.8	5.5	6.0	7.4	7.6
TM2	4	258	450	440.56	0.5	3.0	4.8	6.4	7.2	7.8	9.1
TM2	4	259	450	478.19	0.5	7.1	7.8	11.0	11.0	11.0	11.0
TM2	4	264	450	415.27	0.5	3.3	5.6	8.3	8.7	12.0	11.0
TM2	4	267	450	345.91	0.5	6.6	6.7	5.5	7.2	7.7	10.0
Control	5	255	0	0.00	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Control	5	269	0	0.00	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Control	5	270	0	0.00	0.5	0.5	0.5	0.5	0.5	0.5	0.5

*Average body weight-adjusted dose for each pig over the course of the study (days 0-14).

Dose units: ug/kg-d

 Data point flagged as potential outlier (group mean < 5 $\mu\text{g}/\text{dL}$)

 Data point flagged as potential outlier (group mean > 5 $\mu\text{g}/\text{dL}$)

TABLE B-8 AREA UNDER CURVE DETERMINATIONS

FIGURE B-1 BLOOD LEAD DATA BY DAY

